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(54) **INFORMATION PROCESSING APPARATUS, METHOD OF CONTROLLING SAME, AND STORAGE MEDIUM**

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(57) **ABSTRACT**

An information processing apparatus includes a registration unit and a reception unit. The registration unit can register a first image forming apparatus in a virtual printer. The reception unit receives capability information from the first image forming apparatus. The capability information includes at least information indicating that the first image forming apparatus executes an encrypted print job. The registration unit does not register a second image forming apparatus corresponding to predetermined capability information received by the reception unit. The predetermined capability information does not include information that the second image forming apparatus executes the encrypted print job.

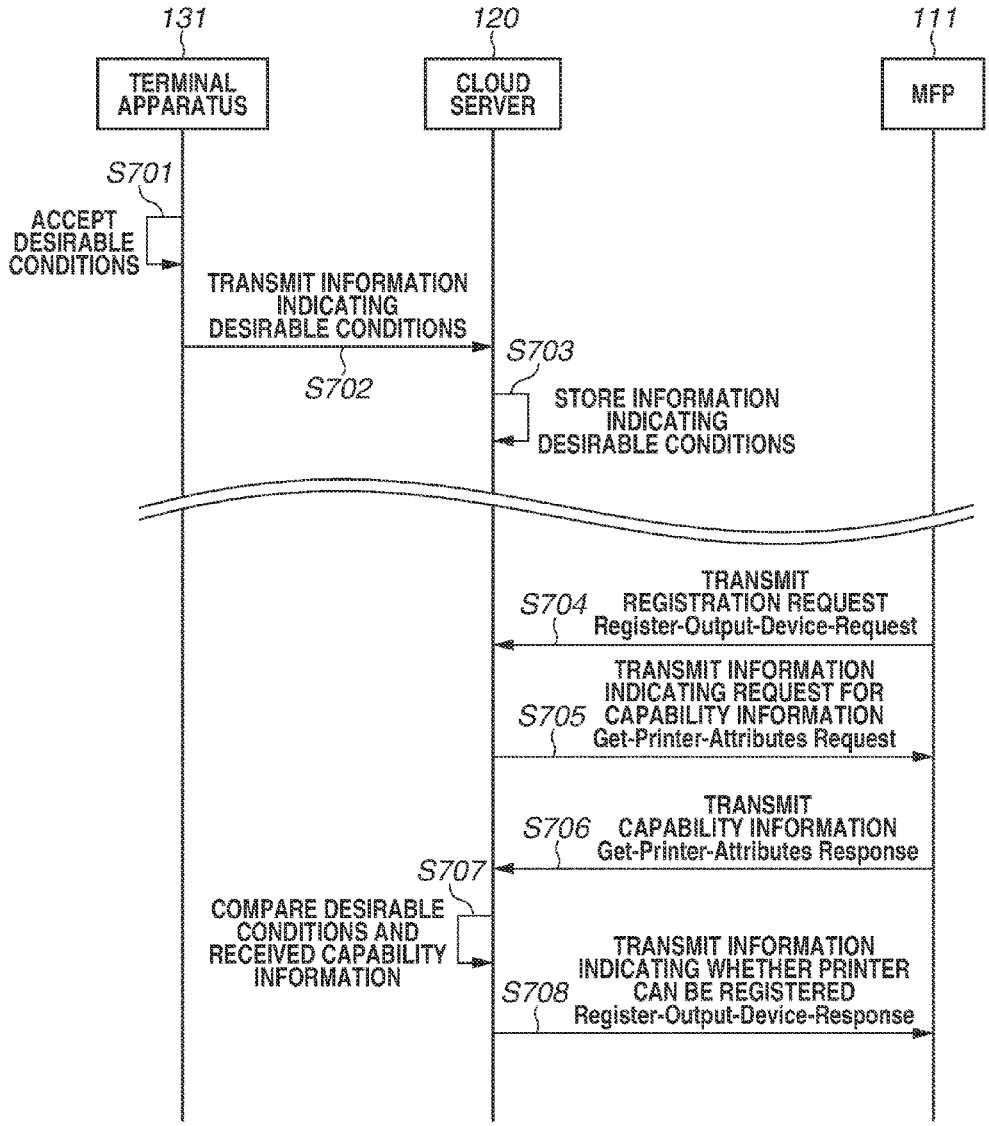


FIG.1

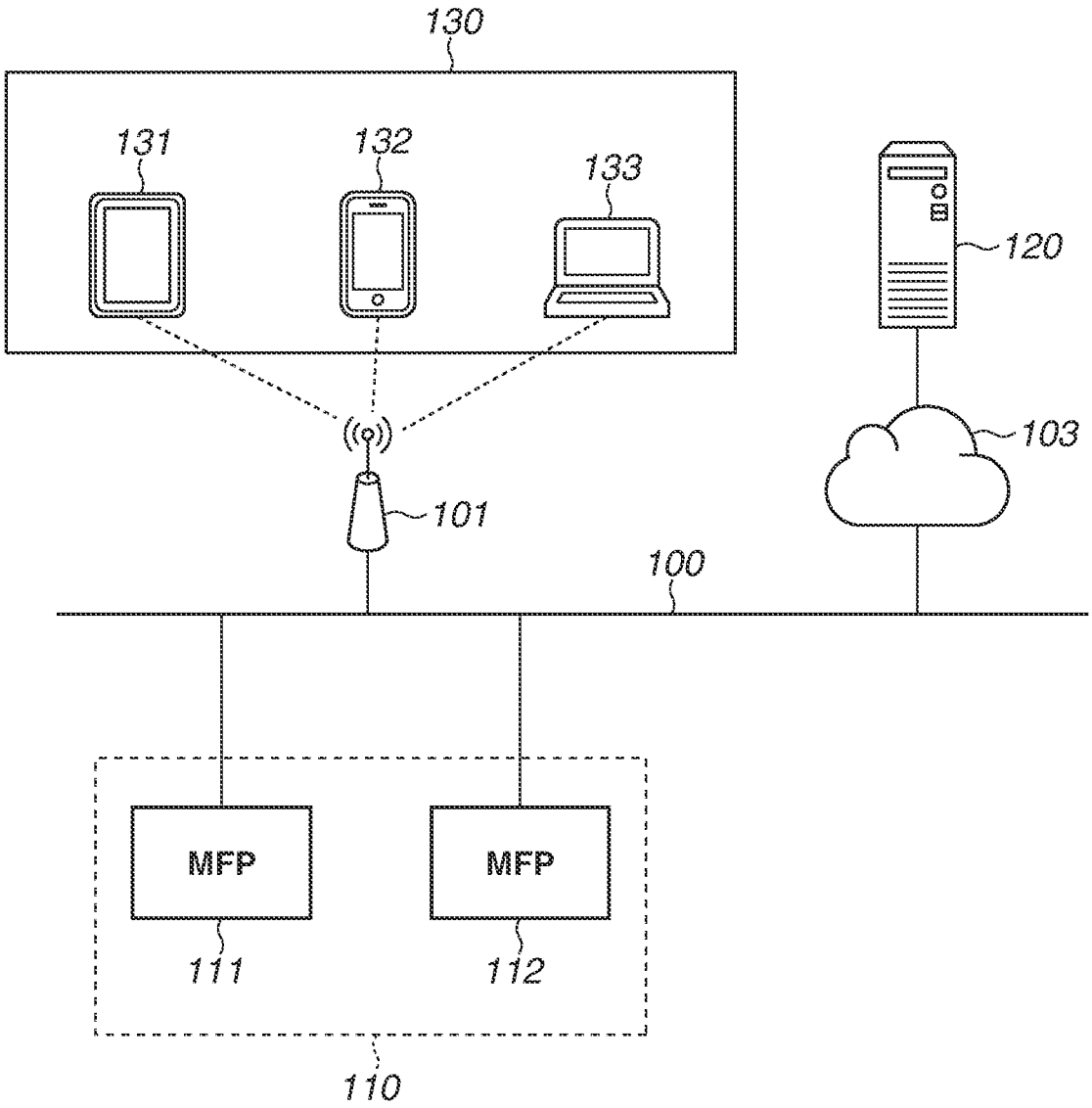


FIG.2

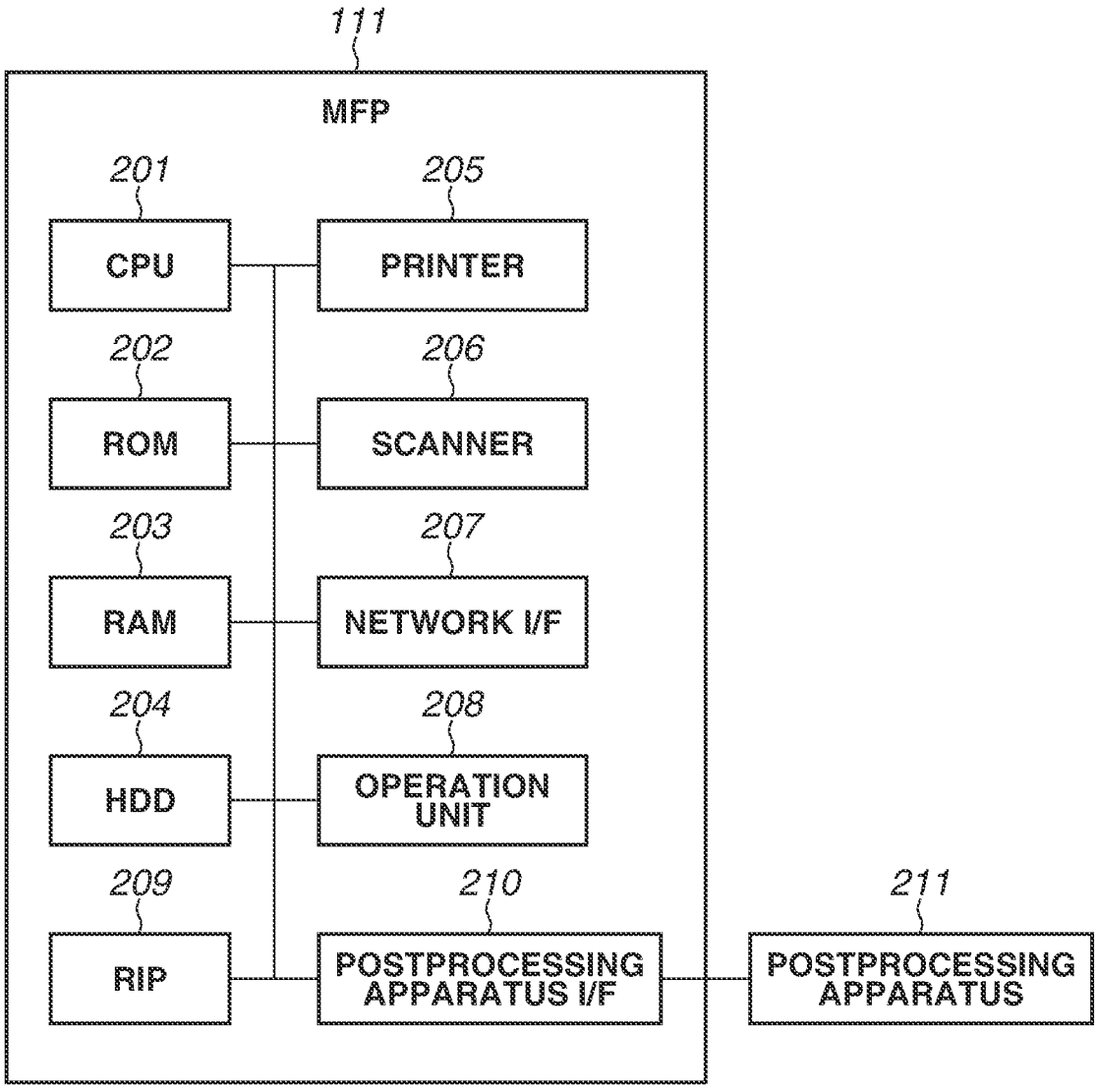

111
MFP
201
CPU
205
PRINTER
202
ROM
206
SCANNER
203
RAM
207
NETWORK I/F
204
HDD
208
OPERATION UNIT
209
RIP
210
POSTPROCESSING APPARATUS I/F
211
POSTPROCESSING APPARATUS

FIG.3

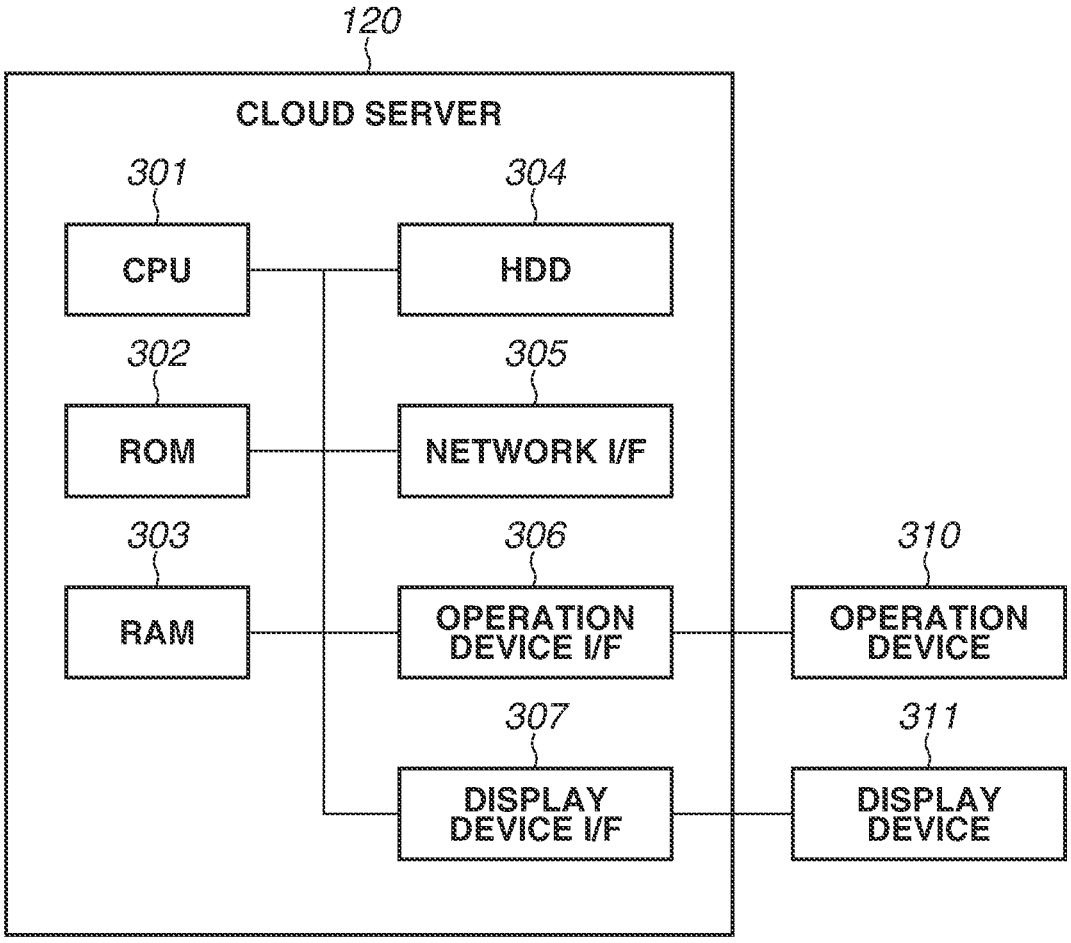

120
CLOUD SERVER
301
CPU
304
HDD
302
ROM
305
NETWORK I/F
303
RAM
306
OPERATION DEVICE I/F
310
OPERATION DEVICE
307
DISPLAY DEVICE I/F
311
DISPLAY DEVICE

FIG.4

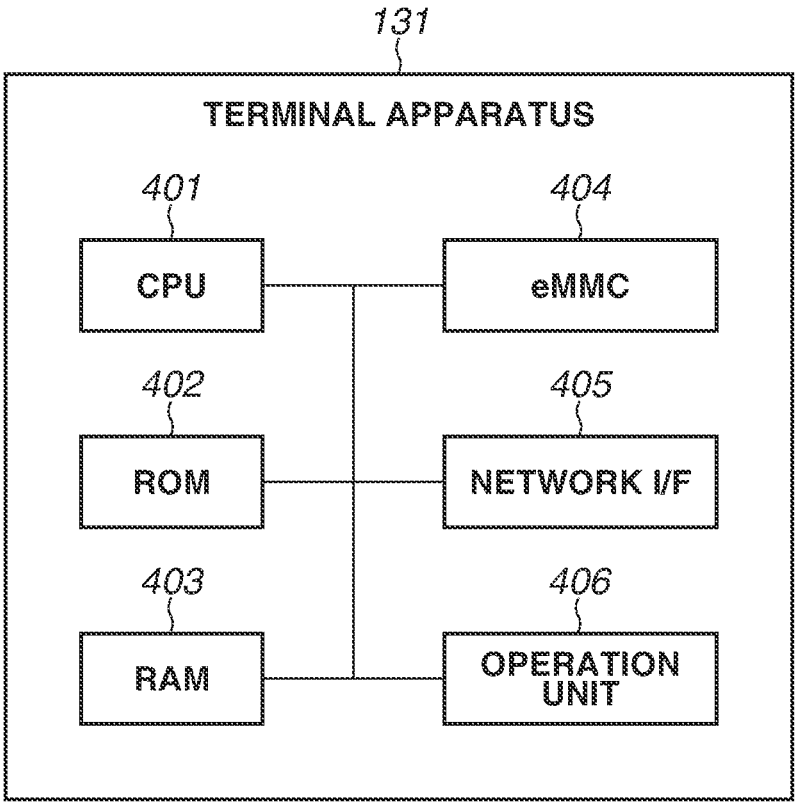

131
TERMINAL APPARATUS
401
CPU
404
eMMC
402
ROM
405
NETWORK I/F
403
RAM
406
OPERATION UNIT

FIG.5

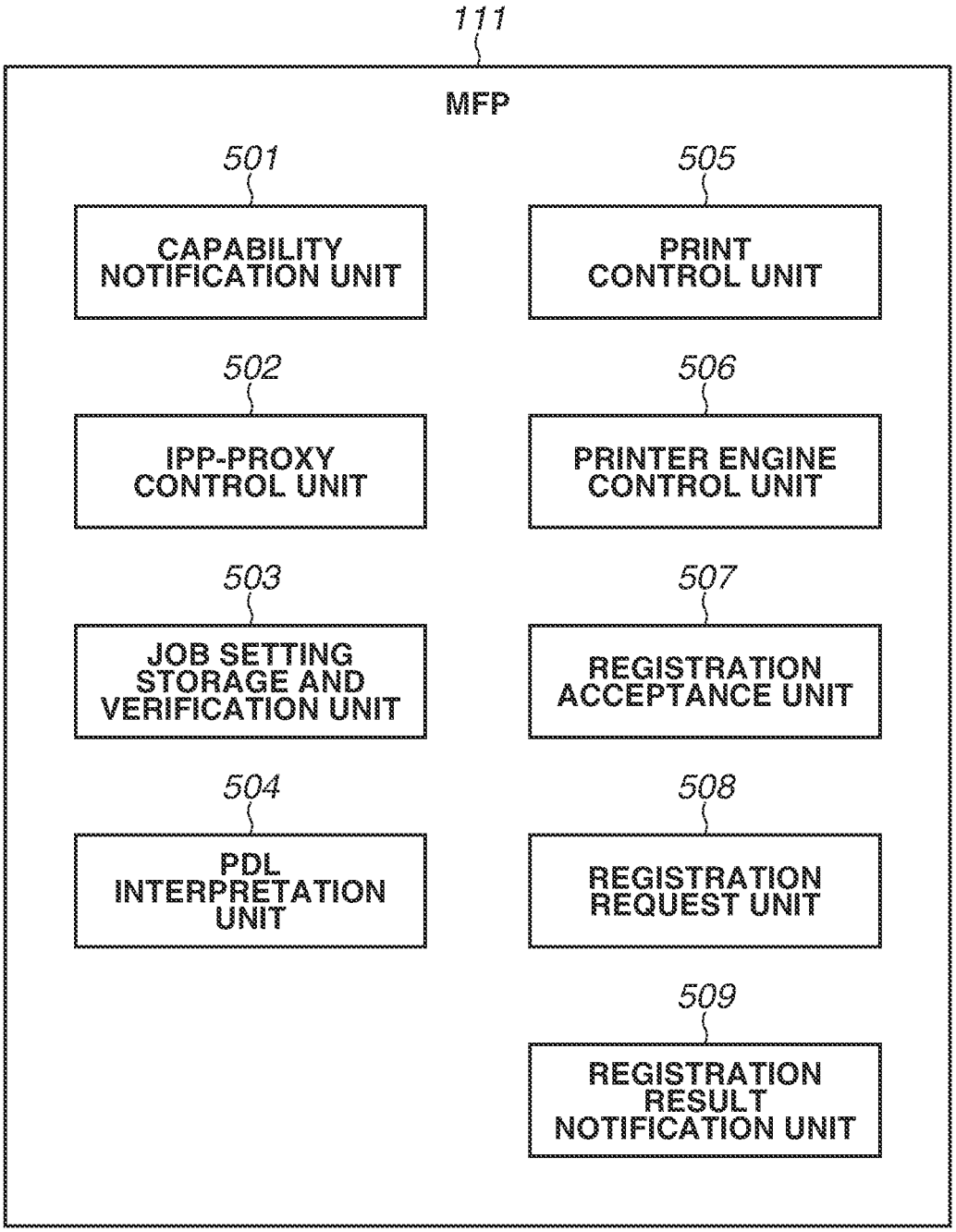

111
MFP
501
CAPABILITY NOTIFICATION UNIT
502
IPP-PROXY CONTROL UNIT
503
JOB SETTING STORAGE AND VERIFICATION UNIT
504
PDL INTERPRETATION UNIT
505
PRINT CONTROL UNIT
506
PRINTER ENGINE CONTROL UNIT
507
REGISTRATION ACCEPTANCE UNIT
508
REGISTRATION REQUEST UNIT
509
REGISTRATION RESULT NOTIFICATION UNIT

FIG.6

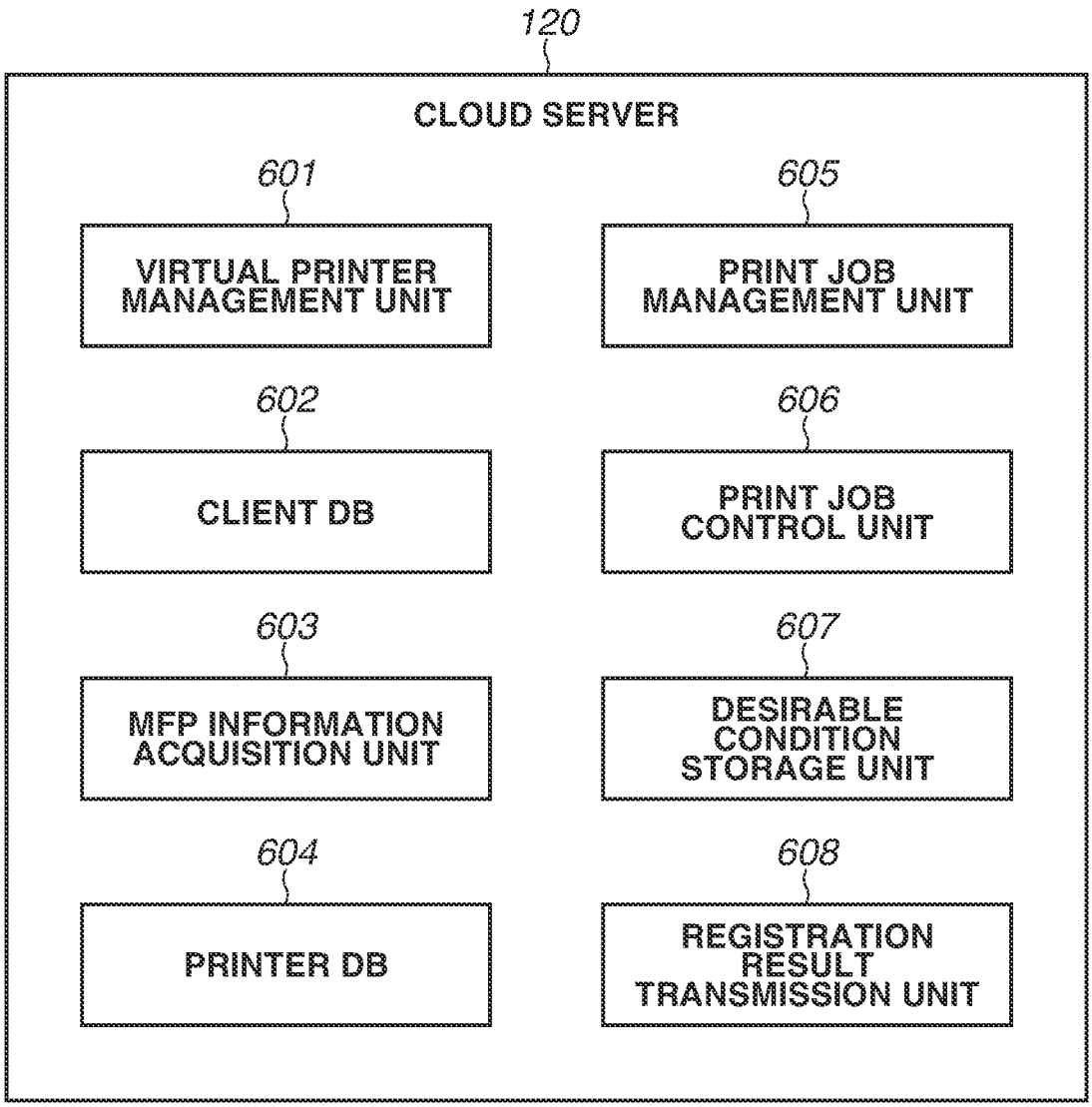

120
CLOUD SERVER
601
VIRTUAL PRINTER MANAGEMENT UNIT
602
CLIENT DB
603
MFP INFORMATION ACQUISITION UNIT
604
PRINTER DB
605
PRINT JOB MANAGEMENT UNIT
606
PRINT JOB CONTROL UNIT
607
DESIRABLE CONDITION STORAGE UNIT
608
REGISTRATION RESULT TRANSMISSION UNIT

FIG.7

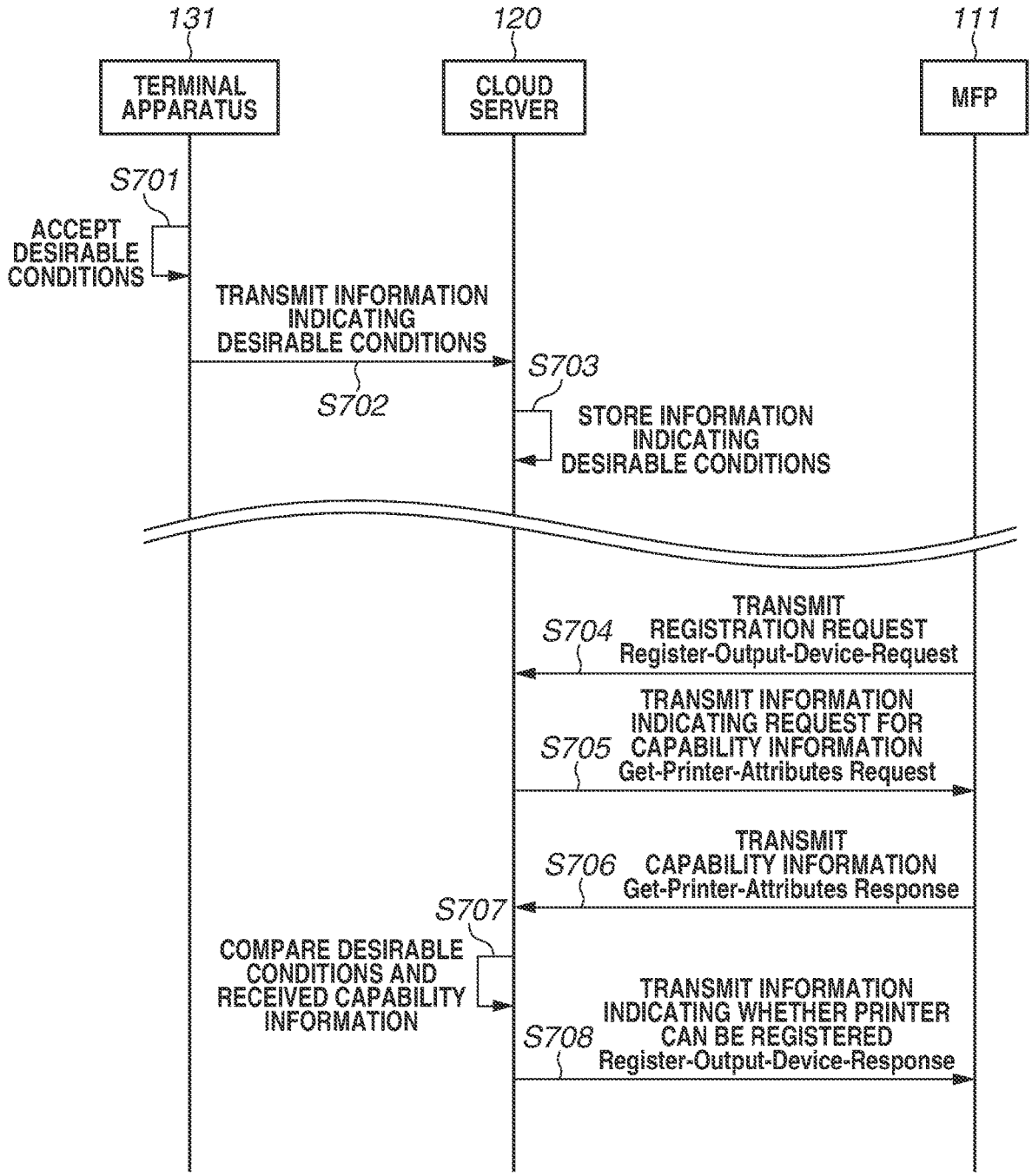

131
120
111
TERMINAL APPARATUS
CLOUD SERVER
MFP
S701
ACCEPT DESIRABLE CONDITIONS
TRANSMIT INFORMATION INDICATING DESIRABLE CONDITIONS
S702
S703
STORE INFORMATION INDICATING DESIRABLE CONDITIONS
S704
TRANSMIT REGISTRATION REQUEST
Register-Output-Device-Request
S705
TRANSMIT INFORMATION INDICATING REQUEST FOR CAPABILITY INFORMATION
Get-Printer-Attributes Request
S706
TRANSMIT CAPABILITY INFORMATION
Get-Printer-Attributes Response
S707
COMPARE DESIRABLE CONDITIONS AND RECEIVED CAPABILITY INFORMATION
S708
TRANSMIT INFORMATION INDICATING WHETHER PRINTER CAN BE REGISTERED
Register-Output-Device-Response

FIG.8

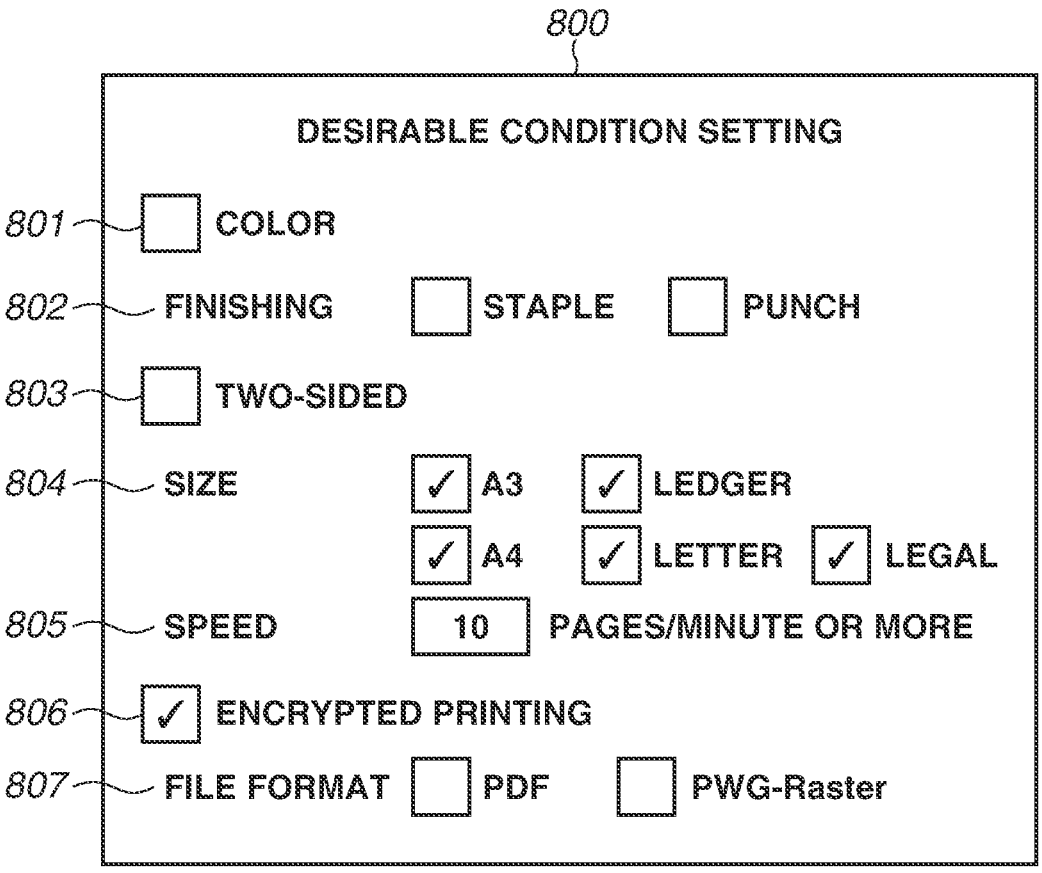

800
DESIRABLE CONDITION SETTING
801
COLOR
802
FINISHING
STAPLE
PUNCH
803
TWO-SIDED
804
SIZE
A3
LEDGER
A4
LETTER
LEGAL
805
SPEED
10
PAGES/MINUTE OR MORE
806
ENCRYPTED PRINTING
807
FILE FORMAT
PDF
PWG-Raster

FIG.9A

(CAPABILITIES OF MFP 111) 901

COLOR OUTPUT: MONOCHROME
FINISHING PROCESSING: STAPLE, PUNCH
TWO-SIDED PRINTING: LONG-SIDED BINDING, SHORT-SIDED BINDING
SHEET SIZE: A4, LETTER, LEGAL, A3, LEDGER
PRINTING SPEED: 60 PAGES/MINUTE
ENCRYPTED PRINTING: SUPPORTED
FILE FORMAT: PDF, PWG-Raster

FIG.9B

(CAPABILITIES OF MFP 112) 902

COLOR OUTPUT: MONOCHROME, COLOR
FINISHING PROCESSING: NONE
TWO-SIDED PRINTING: NOT SUPPORTED
SHEET SIZE: A4, LETTER, LEGAL
PRINTING SPEED: 20 PAGES/MINUTE
ENCRYPTED PRINTING: SUPPORTED
FILE FORMAT: PWG-Raster

FIG.10

1010

```
Internet Printing Protocol
   version: 2.0
    peration-id: Register-Output-Device Request
    equest-id: 1
    peration-attributes-tag
       attributes-charset (charset): 'utf-8'
          name: attributes-charset
          charset value: 'utf-8'
       attributes-natural-language (naturalLanguage): 'en-us'
          name: attributes-natural-language
          naturalLanguage value: 'en-us'
       printer-uri (uri): 'ipp://XXXXX.local.:631/ipp/print'
          name: printer-uri
          uri value: 'ipp://XXXXX.local.:631/ipp/print'
```

1011

1020

```
Internet Printing Protocol
   version: 2.0
   operation-id: Get-Printer-Attributes (0x000b)
   request-id: 2
   operation-attributes-tag
       attributes-charset (charset): 'utf-8'
          name: attributes-charset
          charset value: 'utf-8'
       attributes-natural-language (naturalLanguage): 'en-us'
          name: attributes-natural-language
          naturalLanguage value: 'en-us'
       printer-uri (uri): 'ipp://www.example.com.:631/ipp/print'
          name: printer-uri
          uri value: 'ipp://www.example.com.:631/ipp/print'
       [truncated]requested-attributes:
          name: requested-attributes
          keyword value: 'color-supported'
          keyword value: 'finishings-supported'
          keyword value: 'sides-supported'
          keyword value: 'media-supported'
          keyword value: 'pages-per-minute'
          keyword value: 'document-encryption-ciphers-supported'
          keyword value: 'document-format-supported'
```

1021

FIG.11

1110

```
Internet Printing Protocol
   version: 2.0
   status-code: Successful (successful-ok)
   request-id: 2
   operation-attributes-tag
      attributes-charset (charset): 'utf-8'
      attributes-natural-language (naturalLanguage): 'en-us'
   printer-attributes-tag                                          1111
      color-supported (boolean): false
      finishings-supported (enum): staple, punch
      sides-supported (1setOf keyword): 'one-sided','two-sided-long-edge','two-sided-short-edge'
      media-supported (1setOf keyword): 'iso_a4_210x297mm','na_letter_8.5x11in','na_legal_8.5x14in'
                                        ,'iso_a3_297x420mm','na_ledger_11x17in'
      pages-per-minute (integer): 60
      document-encryption-ciphers-supported (1setOf type2 keyword): 'AES'
      document-format-supported (1setOf mimeMediaType): 'application/pdf','image/pwg-raster'
```

1120

```
Internet Printing Protocol
   version: 2.0
   status-code: Successful (successful-ok)
   request-id: 2
   operation-attributes-tag
      attributes-charset (charset): 'utf-8'
      attributes-natural-language (naturalLanguage): 'en-us'
   printer-attributes-tag                                          1121
      color-supported (boolean): true
      finishings-supported (enum): none
      sides-supported (1setOf keyword): 'one-sided'
      media-supported (1setOf keyword): 'iso_a4_210x297mm','na_letter_8.5x11in','na_legal_8.5x14in'
      pages-per-minute (integer): 20
      document-encryption-ciphers-supported (1setOf type2 keyword): 'AES'
      document-format-supported (1setOf mimeMediaType): 'image/pwg-raster'
```

FIG.12

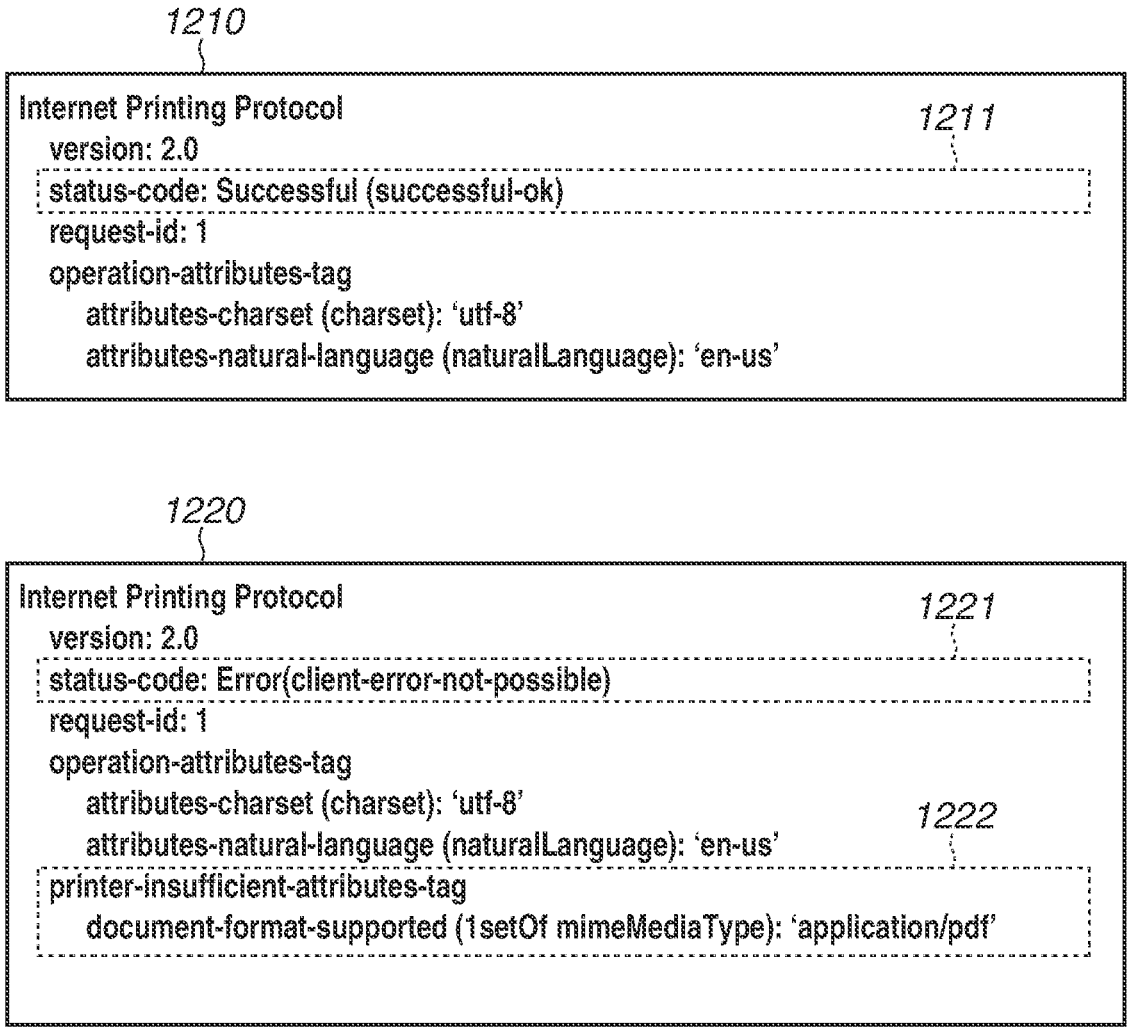

1210
Internet Printing Protocol
version: 2.0
1211
status-code: Successful (successful-ok)
request-id: 1
operation-attributes-tag
attributes-charset (charset): 'utf-8'
attributes-natural-language (naturalLanguage): 'en-us'
1220
Internet Printing Protocol
version: 2.0
1221
status-code: Error(client-error-not-possible)
request-id: 1
operation-attributes-tag
attributes-charset (charset): 'utf-8'
attributes-natural-language (naturalLanguage): 'en-us'
1222
printer-insufficient-attributes-tag
document-format-supported (1setOf mimeMediaType): 'application/pdf'

FIG.13

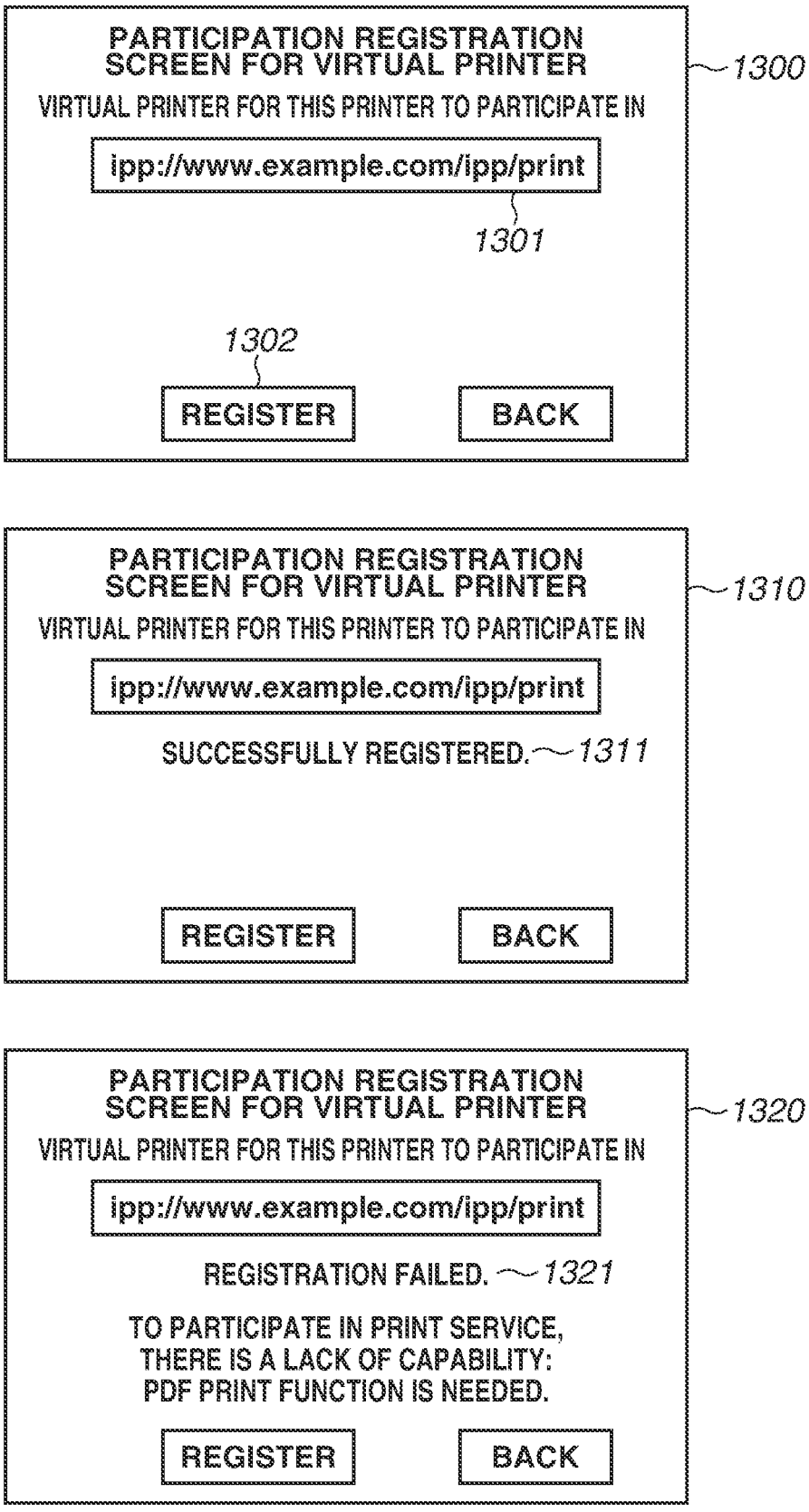

PARTICIPATION REGISTRATION SCREEN FOR VIRTUAL PRINTER
1300
VIRTUAL PRINTER FOR THIS PRINTER TO PARTICIPATE IN
ipp://www.example.com/ipp/print
1301
1302
REGISTER
BACK
PARTICIPATION REGISTRATION SCREEN FOR VIRTUAL PRINTER
1310
VIRTUAL PRINTER FOR THIS PRINTER TO PARTICIPATE IN
ipp://www.example.com/ipp/print
SUCCESSFULLY REGISTERED.
1311
REGISTER
BACK
PARTICIPATION REGISTRATION SCREEN FOR VIRTUAL PRINTER
1320
VIRTUAL PRINTER FOR THIS PRINTER TO PARTICIPATE IN
ipp://www.example.com/ipp/print
REGISTRATION FAILED.
1321
TO PARTICIPATE IN PRINT SERVICE,
THERE IS A LACK OF CAPABILITY:
PDF PRINT FUNCTION IS NEEDED.
REGISTER
BACK

FIG.14

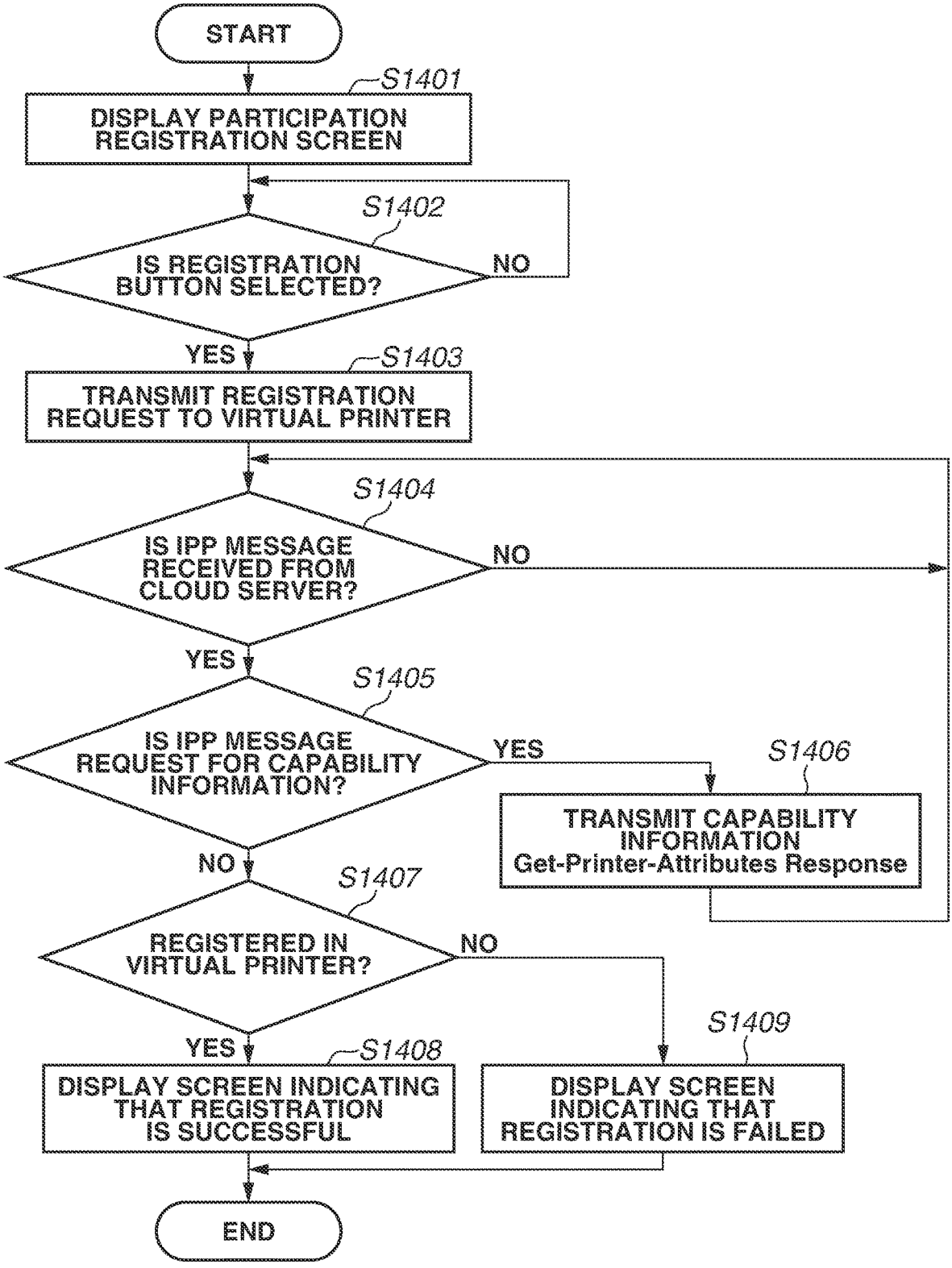

START
S1401
DISPLAY PARTICIPATION REGISTRATION SCREEN
S1402
IS REGISTRATION BUTTON SELECTED?
NO
YES
S1403
TRANSMIT REGISTRATION REQUEST TO VIRTUAL PRINTER
S1404
IS IPP MESSAGE RECEIVED FROM CLOUD SERVER?
NO
YES
S1405
IS IPP MESSAGE REQUEST FOR CAPABILITY INFORMATION?
YES
S1406
TRANSMIT CAPABILITY INFORMATION Get-Printer-Attributes Response
NO
S1407
REGISTERED IN VIRTUAL PRINTER?
NO
YES
S1408
DISPLAY SCREEN INDICATING THAT REGISTRATION IS SUCCESSFUL
S1409
DISPLAY SCREEN INDICATING THAT REGISTRATION IS FAILED
END

FIG.15

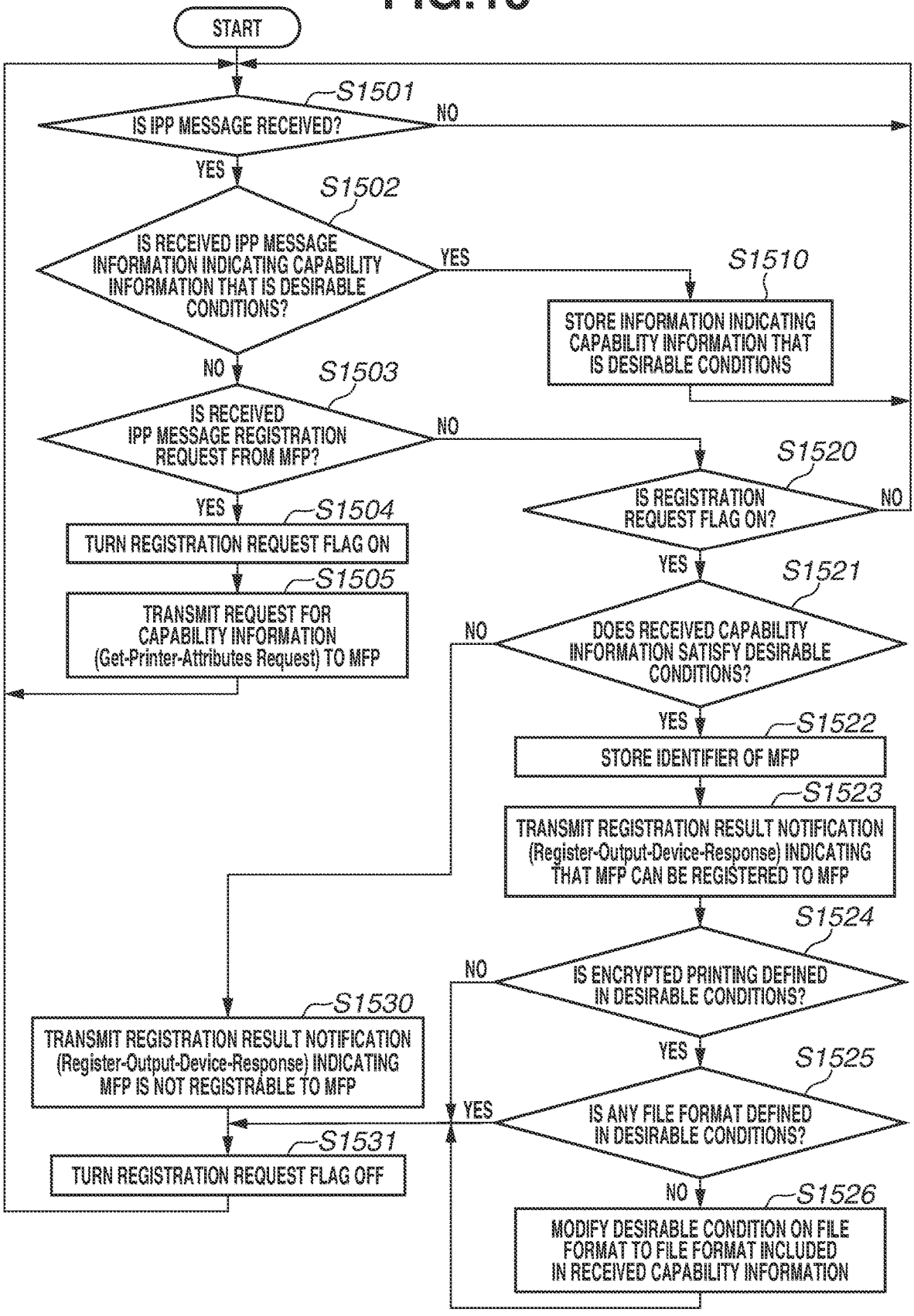

START
S1501
IS IPP MESSAGE RECEIVED?
NO
YES
S1502
IS RECEIVED IPP MESSAGE INFORMATION INDICATING CAPABILITY INFORMATION THAT IS DESIRABLE CONDITIONS?
YES
S1510
STORE INFORMATION INDICATING CAPABILITY INFORMATION THAT IS DESIRABLE CONDITIONS
NO
S1503
IS RECEIVED IPP MESSAGE REGISTRATION REQUEST FROM MFP?
NO
S1520
IS REGISTRATION REQUEST FLAG ON?
NO
YES
S1504
TURN REGISTRATION REQUEST FLAG ON
S1505
TRANSMIT REQUEST FOR CAPABILITY INFORMATION (Get-Printer-Attributes Request) TO MFP
YES
S1521
DOES RECEIVED CAPABILITY INFORMATION SATISFY DESIRABLE CONDITIONS?
NO
YES
S1522
STORE IDENTIFIER OF MFP
S1523
TRANSMIT REGISTRATION RESULT NOTIFICATION (Register-Output-Device-Response) INDICATING THAT MFP CAN BE REGISTERED TO MFP
S1524
IS ENCRYPTED PRINTING DEFINED IN DESIRABLE CONDITIONS?
NO
YES
S1525
IS ANY FILE FORMAT DEFINED IN DESIRABLE CONDITIONS?
YES
NO
S1526
MODIFY DESIRABLE CONDITION ON FILE FORMAT TO FILE FORMAT INCLUDED IN RECEIVED CAPABILITY INFORMATION
S1530
TRANSMIT REGISTRATION RESULT NOTIFICATION (Register-Output-Device-Response) INDICATING MFP IS NOT REGISTRABLE TO MFP
S1531
TURN REGISTRATION REQUEST FLAG OFF

FIG.16

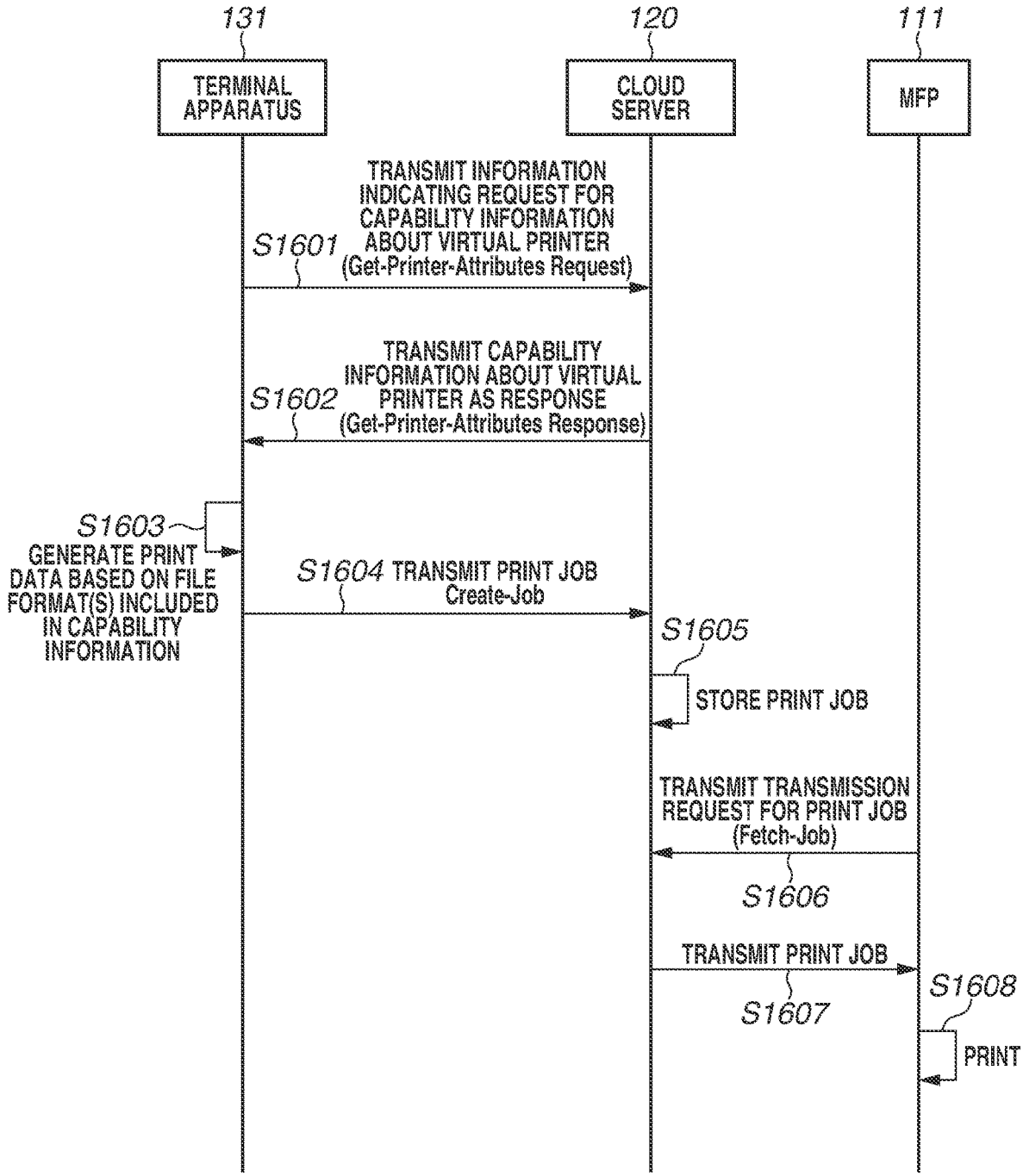
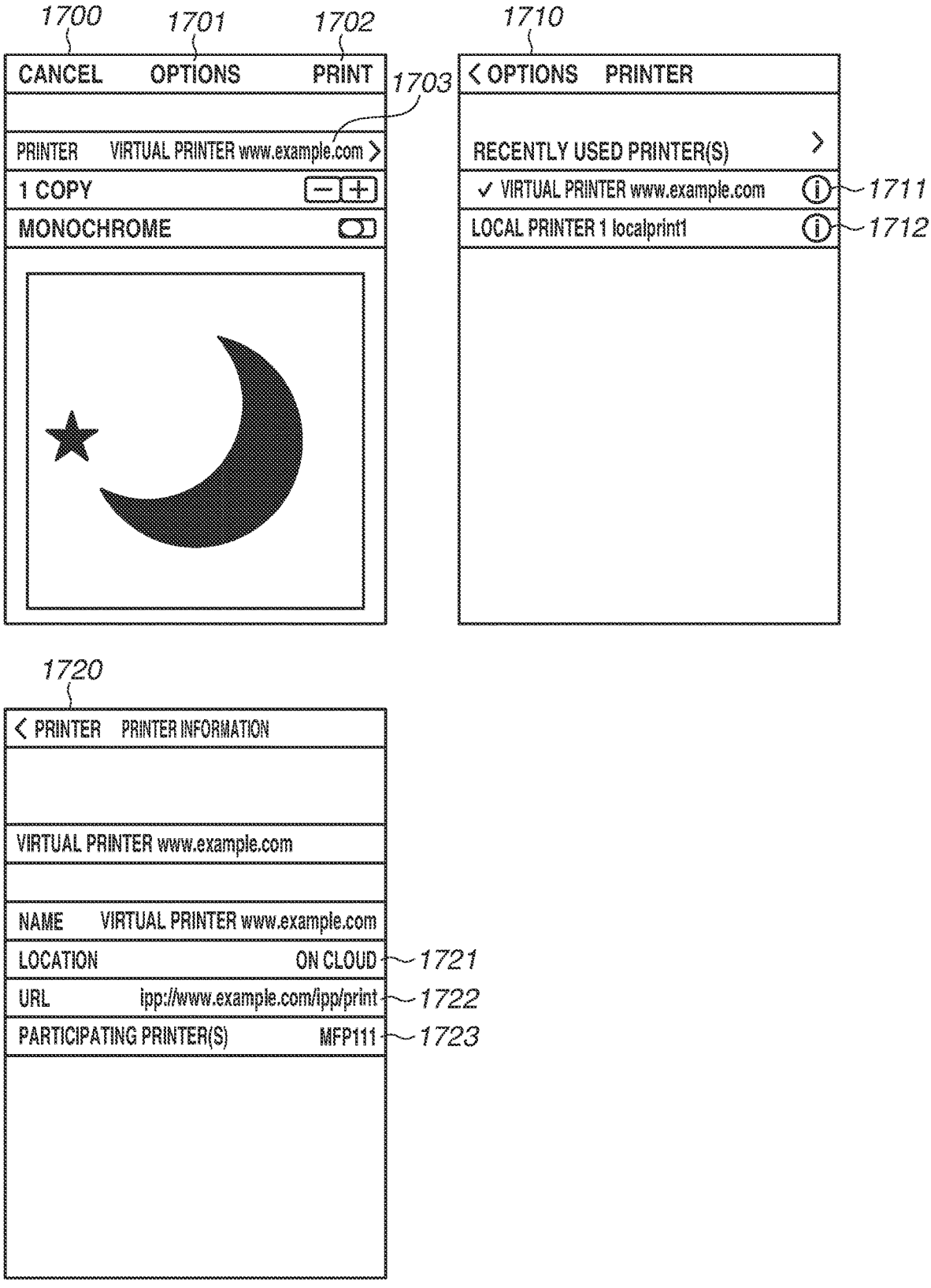

131
120
111
TERMINAL APPARATUS
CLOUD SERVER
MFP
TRANSMIT INFORMATION INDICATING REQUEST FOR CAPABILITY INFORMATION ABOUT VIRTUAL PRINTER (Get-Printer-Attributes Request)
S1601
TRANSMIT CAPABILITY INFORMATION ABOUT VIRTUAL PRINTER AS RESPONSE (Get-Printer-Attributes Response)
S1602
S1603
GENERATE PRINT DATA BASED ON FILE FORMAT(S) INCLUDED IN CAPABILITY INFORMATION
S1604 TRANSMIT PRINT JOB Create-Job
S1605
STORE PRINT JOB
TRANSMIT TRANSMISSION REQUEST FOR PRINT JOB (Fetch-Job)
S1606
TRANSMIT PRINT JOB
S1607
S1608
PRINT

FIG.17


1700
1701
1702
1703
1710
CANCEL
OPTIONS
PRINT
PRINTER
VIRTUAL PRINTER www.example.com
1 COPY
MONOCHROME
OPTIONS
PRINTER
RECENTLY USED PRINTER(S)
✓ VIRTUAL PRINTER www.example.com
1711
LOCAL PRINTER 1 localprint1
1712
1720
PRINTER
PRINTER INFORMATION
VIRTUAL PRINTER www.example.com
NAME
VIRTUAL PRINTER www.example.com
LOCATION
ON CLOUD
1721
URL
ipp://www.example.com/ipp/print
1722
PARTICIPATING PRINTER(S)
MFP111
1723

INFORMATION PROCESSING APPARATUS, METHOD OF CONTROLLING SAME, AND STORAGE MEDIUM

BACKGROUND

Field

[0001] The present disclosure relates to an information processing apparatus, a method of controlling the same, and a storage medium.

Description of the Related Art

[0002] A printing system where a plurality of image forming apparatuses such as a multifunction peripheral is connected to an information processing apparatus such as a personal computer (PC) and the plurality of image forming apparatuses performs print processing on print jobs generated by the information processing apparatus in a shared manner has been known.

[0003] Concerning such a printing system, a technique for registering the plurality of image forming apparatuses in a server as output devices, storing a print job transmitted from a terminal apparatus in the server, and causing an image forming apparatus to execute the print job stored in the server has been discussed (Japanese Patent Application Laid-Open No. 2005-165393).

[0004] Techniques by which a server converts a print job into a format printable by an image forming apparatus and transmits the converted print job to the image forming apparatus have also been discussed ((Request for Comments (RFC) 2911: https://tools.ietf.org/html/rfc2911), (Printer Working Group (PWG) 5100.13: Job and Printer Extensions, https://ftp.pwg.org/pub/pwg/candidates/cs-ippjobprinterext3v10-20120727-5100.13.pdf), (PWG: Internet Printing Protocol (IPP) Shared Infrastructure Extensions, ftp://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippsix10-20140226.pdf), and (PWG: PWG Raster Format, ftp://ftp.pwg.org/pub/pwg/candidates/cs-ippraster10-20120420-5102.4.pdf)).

[0005] In addition, a technique for encrypting a print job itself for a terminal apparatus to transmit and thereby preventing illegal tapping and tampering of the print job stored in the cloud server by third parties has been discussed (PWG: IPP Document Encryption, http://ftp.pwg.org/pub/pwg/ipp/whitepaper/tb-doccrypt-20180205.pdf).

[0006] Suppose, for example, that in a printing system such as that discussed in Japanese Patent Application Laid-Open No. 2005-165393, the user operates an image forming apparatus and the image forming apparatus receives a print job stored in an information processing apparatus, such as a server, from the information processing apparatus and executes the print job. In such a case, the following issue can occur.

[0007] If, for example, some of the plurality of image forming apparatuses registered in the information processing apparatus support encrypted printing and some do not, an encrypted print job transmitted from the information processing apparatus by the user operation is not always executable. It may therefore be desirable for the user to check whether the image forming apparatus he/she intends to run the print job on can execute the print job, which is troublesome.

SUMMARY

[0008] The present disclosure is directed to reducing a user's trouble when an image forming apparatus receives an encrypted print job stored in an information processing apparatus from the information processing apparatus and executes the print job based on the user's operations.

[0009] According to an aspect of the present disclosure, an information processing apparatus includes a registration unit configured to register a first image forming apparatus in a virtual printer, and a reception unit configured to receive capability information from the first image forming apparatus, wherein the capability information includes at least information indicating that the first image forming apparatus executes an encrypted print job, wherein the registration unit is configured not to register a second image forming apparatus corresponding to predetermined capability information received by the reception unit, and wherein the predetermined capability information does not include information that the second image forming apparatus executes the encrypted print job.

[0010] Further features of the present disclosure will become apparent from the following description of exemplary embodiments with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. **1** is a diagram illustrating an example of a configuration of a printing system.

[0012] FIG. **2** is a diagram illustrating an example of a hardware configuration of a multifunction peripheral (MFP).

[0013] FIG. **3** is a diagram illustrating an example of a hardware configuration of a cloud server.

[0014] FIG. **4** is a diagram illustrating an example of a hardware configuration of a terminal apparatus.

[0015] FIG. **5** is a diagram illustrating an example of a software configuration of the MFP.

[0016] FIG. **6** is a diagram illustrating an example of a software configuration of the cloud server.

[0017] FIG. **7** is a diagram illustrating an example of a sequence in registering information about the MFP in a virtual printer.

[0018] FIG. **8** is a diagram illustrating an example of a setting screen for desirable conditions, displayed on an operation unit of the terminal apparatus.

[0019] FIG. **9** is a diagram illustrating an example of capability information about MFPs.

[0020] FIG. **10** is a diagram illustrating examples of messages in transmitting a printer registration request and a registration result notification in Internet Printing Protocol (IPP) communication between the cloud server and an MFP.

[0021] FIG. **11** is a diagram illustrating examples of a message in transmitting capability information about an MFP in the IPP communication between the cloud server and the MFP.

[0022] FIG. **12** is a diagram illustrating examples of a message of the registration result notification (Register-Output-Device-Response) that the cloud server transmits to an MFP in the IPP communication between the cloud server and the MFP.

[0023] FIG. **13** is a diagram illustrating examples of a participation registration screen displayed on the operation unit of an MFP.

[0024] FIG. **14** is a flowchart illustrating an example of processing in registering an MFP in the virtual printer.

[0025] FIG. **15** is a flowchart illustrating an example of processing when the cloud server registers an MFP.

[0026] FIG. **16** is a diagram illustrating an example of a sequence of print processing for transmitting a print job from a terminal apparatus to the cloud server and executing the print job by an MFP.

[0027] FIG. **17** is a diagram illustrating examples of a print setting screen displayed on the operation unit of a terminal apparatus.

DESCRIPTION OF THE EMBODIMENTS

[0028] Exemplary embodiments of the present disclosure will be described below with reference to the drawings. The configurations described in the following exemplary embodiments are just examples, and the present disclosure is not limited to the illustrated configurations.

[0029] A first exemplary embodiment will be described below. FIG. **1** is a diagram illustrating an example of a configuration of a printing system. The printing system illustrated in FIG. **1** includes multifunction peripherals (MFPs) **111** and **112** that are examples of an image forming apparatus, terminal apparatuses **131**, **132**, and **133** that are examples of an external apparatus, and a cloud server **120** that is an example of an information processing apparatus and runs a virtual printer. The MFPs **111** and **112** may be referred to collectively as MFPs **110**. Examples of the terminal devices **131**, **132**, and **133** include external apparatuses such as a tablet, a smartphone, and a personal computer (PC). The terminal apparatuses **131**, **132**, and **133** may be referred to collectively as terminal apparatuses **130**.

[0030] The MFPs **110** and the terminal apparatuses **130** are connected to each other via an access point **101** connected to a local area network (LAN) **100**. In the present exemplary embodiment, the terminal apparatuses **130** are connected to the LAN **100** by wireless communication. However, this is not restrictive. For example, the terminal apparatuses **130** may be connected to the LAN **100** by wired connection.

[0031] The LAN **100** to which the MFPs **110** and the terminal apparatuses **130** are connected is connected to the Internet **103**. The MFPs **110** and the terminal apparatuses **130** can connect to the cloud server **120** via the Internet **103**.

[0032] The MFPs **111** and **112** may have the same or different print processing capabilities.

[0033] While the present exemplary embodiment is described by using the foregoing configuration example as an example of the printing system, the configuration of the printing system is not limited thereto. At least one terminal apparatus and at least one MFP may be connected to the cloud server **120** via the LAN **100** and the Internet **103**. The LAN **100** may be a wireless or wired network.

[0034] In the present printing system, print jobs are not directly transmitted from the terminal apparatuses **130** to the MFPs **110**, but once transmitted to the cloud server **120** via the Internet **103** and stored in the cloud server **120**. The MFPs **110** then request the print jobs in the cloud server **120** and execute the received print jobs. A print job refers to data including a command for causing an MFP **110** to perform print processing, image data, and print setting information.

[0035] While the present exemplary embodiment is described by using the foregoing configuration example as an example of the printing system, the present disclosure is not limited thereto. At least one information processing apparatus and at least one image forming apparatus may be communicably connected via a network. The network may be a wireless or wired one.

[0036] FIG. **2** is a diagram illustrating an example of a hardware configuration of the MFP **111**. The MFP **111** includes a central processing unit (CPU) **201**, a read-only memory (ROM) **202**, a random access memory (RAM) **203**, a hard disk drive (HDD) **204**, a printer **205**, a scanner **206**, a network interface (I/F) **207**, and an operation unit **208**.

[0037] The MFP **111** also includes a raster image processor (RIP) **209** and a postprocessing apparatus I/F **210**.

[0038] The CPU **201** controls the MFP **111** in a centralized manner. The CPU **201** transmits signals to various pieces of hardware via a bus line and performs mutual data communication with other pieces of hardware.

[0039] The ROM **202** stores programs and various types of data to be used by the CPU **201**. The RAM **203** is a work memory for temporarily storing programs and data that the CPU **201** uses for calculation. The HDD **204** stores various types of data and various programs. While the MFP **111** according to the present exemplary embodiment is described to use the HDD **204** as an auxiliary storage device by way of example, a nonvolatile memory such as a solid state drive (SSD) may be used as the auxiliary storage device.

[0040] The printer **205** is a unit that implements a print function. The printer **205** performs processing for printing an image on a sheet based on image data included in a print job transmitted from a terminal apparatus **130** via the cloud server **120**.

[0041] The scanner **206** is a unit that implements a scan function. The scanner **206** performs processing for optically reading a document and converting the read document into image data.

[0042] The CPU **201** of the MFP **111** controls operation of the MFP **111** based on control programs in the MFP **111**. More specifically, the CPU **201** executes an operating system (OS) for controlling the MFP **111** and driver programs for controlling hardware I/Fs. Application programs on the OS operate with each other to activate and control user-desired functions. The OS and various programs are stored in the ROM **202**, and read from the ROM **202** into the RAM **203** for execution.

[0043] The network I/F **207** of the MFP **111** may be a wired connection LAN_I/F. A Universal Serial Bus (USB)-LAN adaptor may be used for connection. Alternatively, the network I/F **207** may be a wireless connection LAN_I/F.

[0044] The network I/F **207** of the MFP **111** is connected to the cloud server **120** via the LAN **100** and the Internet **103**.

[0045] The operation unit **208** is a user interface for the user using the MFP **111** to use the printer **205** and the scanner **206**. For example, the operation unit **208** is a touch panel for accepting operations and inputs. The operation unit **208** may also be used as a display unit that displays information about the MFP **111**. An external operation device and/or an external display device may be connected to the MFP **111** according to the present exemplary embodiment.

[0046] The RIP **209** is a hardware module for performing rasterization processing for rendering a page description language (PDL) into a raster image. In the present exemplary embodiment, the RIP **209** is described to be a built-in hardware module by way of example. However, the RIP **209** may be stored in the ROM **202** as a software module.

[0047] The hardware configuration of the MFP **111** has been described with reference to FIG. **2**, and the MFP **112** may have a similar hardware configuration to that of the MFP **111**. As long as the MFP **112** is a predetermined image forming apparatus capable of Internet Printing Protocol (IPP) communication, the MFP **112** may include a CPU and/or RAM of different performance or may have a different printable sheet size. The IPP is an example of a printing protocol.

[0048] In the MFP **111** according to the present exemplary embodiment, one CPU **201** performs various types of processing illustrated in a flowchart to be described below by using one memory (RAM **203**). However, other configurations may be employed. For example, a plurality of CPUs, RAMs, ROMs, and storages may cooperate to perform the various types of processing illustrated in the flowchart to be described below. Part of the processing may be performed by using a hardware circuit such as an application specific integrated circuit (ASIC) and a field-programmable gate array (FPGA).

[0049] The postprocessing apparatus I/F **210** connects the MFP **111** to a postprocessing apparatus **211**. The postprocessing apparatus **211** receives control commands indicating instructions such as punching and stapling instructions from the CPU **201**, and based on the control commands, performs postprocessing on a sheet on which an image is printed by the printer **205**.

[0050] FIG. **3** is a diagram illustrating an example of a hardware configuration of the cloud server **120**.

[0051] The virtual printer (cloud server) **120** includes a CPU **301**, a ROM **302**, a RAM **303**, an HDD **304**, a network I/F **305**, an operation device I/F **306**, and a display device I/F **307**.

[0052] The CPU **301** controls the cloud server **120** in a centralized manner. The CPU **301** transmits signals to various pieces of hardware via a bus line and performs mutual data communication with other pieces of hardware.

[0053] The ROM **302** stores programs and various types of data to be used by the CPU **301**. The RAM **303** is a work memory for temporarily storing programs and data that the CPU **301** uses for calculation. The HDD **304** stores various types of data and various programs. While the cloud server **120** according to the present exemplary embodiment is described to use the HDD **304** as an auxiliary storage device by way of example, a nonvolatile memory such as an SSD may be used as the auxiliary storage device.

[0054] The network I/F **305** may be a wired connection LAN_I/F. A USB-LAN adaptor may be used for connection. Alternatively, the network I/F **305** may be a wireless connection LAN_I/F.

[0055] The network I/F **305** is connected to the MFPs **110** and the terminal apparatuses **130** via the LAN **100** and the Internet **103**.

[0056] The operation device I/F **306** is an I/F for connecting the cloud server **120** to an operation device **310** such as a keyboard and a mouse.

[0057] The display device I/F **307** is an I/F for connecting the cloud server **120** to a display device **311** such as a display.

[0058] FIG. **4** is a diagram illustrating an example of a hardware configuration of the terminal apparatus **131**. The terminal apparatus **131** includes a CPU **401**, a ROM **402**, a RAM **403**, an embedded MultiMedia Card (eMMC) **404**, a network I/F **405**, and an operation unit **406**.

[0059] The CPU **401** controls the terminal apparatus **131** in a centralized manner. The CPU **401** transmits signals to various pieces of hardware via a bus line and performs mutual data communication with other pieces of hardware.

[0060] The ROM **402** stores programs and various types of data to be used by the CPU **401**. The RAM **403** is a work memory for temporarily storing programs and data that the CPU **401** uses for calculation. The eMMC **404** stores various types of data and various programs.

[0061] The network I/F **405** may be a wired connection LAN_I/F. A USB-LAN adaptor may be used for connection. Alternatively, the network IF **405** may be a wireless connection LAN_I/F.

[0062] The network I/F **405** is connected to the cloud server **120** via the LAN **100** and the Internet **103**.

[0063] The operation unit **406** is a user interface for a user to use the terminal apparatus **131**. For example, the operation unit **406** is a touch panel for accepting operations and inputs from the user. The operation unit **406** can also be used as a display unit that displays information about the terminal apparatus **131**. An external operation device and/or an external display device may be connected to the terminal apparatus **131** according to the present exemplary embodiment.

[0064] The hardware configuration of the terminal apparatus **131** has been described with reference to FIG. **4**. The terminal apparatuses **132** and **133** may have a similar hardware configuration to that of the terminal apparatus **131**. As long as the terminal apparatuses **132** and **133** is capable of IPP communication, the rest of the configuration may be different.

[0065] FIG. **5** is a diagram illustrating an example of a software configuration of the MFP **111**. The CPU **201** runs a capability notification unit **501** to transmit capability information about the MFP **111** to the cloud server **120**. Examples of the capability information include the following: "copies-supported" indicating whether the number of copies can be handled; "document-format-supported" indicating a supported format or formats; and "feed-orientation-supported" indicating information about an optimum feed direction.

[0066] The CPU **201** of the MFP **111** runs an IPP-proxy control unit **502** to receive data such as a print job from the cloud server **120** via IPP communication.

[0067] The CPU **201** runs a job setting storage and verification unit **503** to verify attributes of the received print job and store the verified attributes in the RAM **203**. Specifically, the CPU **201** checks print settings included in the print job and stores the print settings in the RAM **203**. For example, the CPU **201** checks and stores the number of copies to be printed, executable finishing processing, and PDL format information.

[0068] The CPU **201** runs a PDL interpretation unit **504** to interpret drawing data included in the received print job. The CPU **201** also controls the RIP **209** to perform the rasterization processing. The PDL interpretation unit **504** according to the present exemplary embodiment supports a Printer Working Group (PWG) Raster format.

[0069] The CPU **201** runs a print control unit **505** to separate the rasterized image data into red, blue, and green (RGB) image data.

[0070] The CPU **201** runs a printer engine control unit **506** to control the printer **205** for page-by-page print processing based on the color-separated RGB image data and the print settings.

[0071] The CPU **201** runs a registration acceptance unit **507** to display a screen for registering a virtual printer in which the MFP **111** is to be registered on the operation unit **208**. FIG. **13** illustrates a participation registration screen **1300** that is an example of the screen. Details of the participation registration screen **1300** will be described below.

[0072] The CPU **201** runs a registration request unit **508** to transmit a registration request (Register-Output-Device-Request) to the virtual printer registered via the participation registration screen **1300**.

[0073] The CPU **201** runs a registration result notification unit **509** to display a registration result on a screen on the operation unit **208** based on information indicating the registration result transmitted from the virtual printer to which the registration request is transmitted. Examples of the screen displayed here include participation registration screens **1310** and **1320**.

[0074] Suppose, for example, that in a printing system such as that discussed in Japanese Patent Application Laid-Open No. 2005-165393, the user operates an image forming apparatus and the image forming apparatus receives a print job stored in an information processing apparatus, such as a server, from the information processing apparatus and executes the print job. In such a case, the following issue can occur.

[0075] If, for example, some of a plurality of image forming apparatuses registered in the information processing apparatus support encrypted printing and some do not, an encrypted print job transmitted from the information processing apparatus by the user is not always executable. It may therefore be desirable for the user to check whether the image forming apparatus he/she intends to run the print job on can execute the print job, which is troublesome.

[0076] To address such an issue, when an image forming apparatus receives an encrypted print job stored in the information processing apparatus from the information processing apparatus and executes the print job based on the user's operations, the user's trouble can be reduced by the execution of processing described below.

[0077] FIG. **6** is a diagram illustrating an example of a software configuration of the cloud server **120**.

[0078] The CPU **301** runs a virtual printer management unit **601** to store client information received by IPP communication into a client database (DB) **602** in the HDD **304**. Examples of the client information includes Internet Protocol (IP) addresses and port numbers of the terminal apparatuses **130**.

[0079] The CPU **301** runs an MFP information acquisition unit **603** to receive MFP information from the MFPs **110** by IPP communication and store the MFP information in a printer DB **604** in the HDD **304**. The MFP information includes identifiers of the MFPs **110**, capability information about the MFPs **110**, and names of the MFPs **110**. Here, an identifier of the virtual printer may also be stored in association with the MFP information.

[0080] The CPU **301** runs a print job management unit **605** to store print jobs received from the terminal apparatuses **130** into a predetermined area of the HDD **304**. Here, the CPU **301** stores the identifier of the virtual printer selected by the users from the terminal apparatuses **130** and identifiers of the print jobs into the HDD **304** in association with each other.

[0081] The CPU **301** runs a print job control unit **606** to transmit a print job stored in the predetermined area of the HDD **304** to an MFP **110** if a request for the print job is received from the MFP **110** by IPP communication.

[0082] The CPU **301** runs a desirable condition storage unit **607** to store capability information that is desirable conditions received from the terminal apparatuses **130** into the HDD **304**.

[0083] The CPU **301** runs a registration result transmission unit **608** to transmit the result of a comparison made between the capability information that is the desirable conditions and received capability information to the MFPs **110**.

[0084] In a conventional printing system, as discussed in PWG "IPP Shared Infrastructure Extensions" ftp://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippsix10-20140226.pdf, an image forming apparatus not supporting PDF can execute a PDF print job if an information processing apparatus, such as a server, converts the format of the PDF print job.

[0085] FIG. **7** is a diagram illustrating an example of a sequence in registering information about the MFP **111** in the virtual printer. The sequence is started when the user operates the terminal apparatus **131** and the cloud server **120** receives a setting instruction for a printer registration condition. The sequence is implemented by IPP communication between the apparatuses.

[0086] In step S**701**, the CPU **401** of the terminal apparatus **131** accepts desirable conditions for registering an MFP in the virtual printer by accepting the user's operations on a setting screen **800** illustrated in FIG. **8**. The desirable conditions are information indicating minimum capabilities that an MFP to be registered in the virtual printer needs to satisfy.

[0087] In step S**702**, the CPU **401** of the terminal apparatus **131** transmits information indicating the desirable conditions for printer registration specified by the user to the cloud server **120**.

[0088] In step S**703**, the CPU **301** of the cloud server **120** stores the received information indicating the desirable conditions into the HDD **304**.

[0089] In step S**704**, the user gives an instruction for registration on the participation registration screen **1300** displayed on the operation unit **208**. The CPU **201** of the MFP **111** transmits a printer registration request (Register-Output-Device-Request) to the cloud server **120**. Details of the participation registration screen **1300** illustrated in FIG. **13** will be described below.

[0090] In step S**705**, the CPU **301** of the virtual printer (cloud server **120**) transmits information (Get-Printer-Attributes Request) indicating a request for capability information about the MFP **111** to the MFP **111** transmitting the participation registration request. Capability information is information indicating functions supported by an MFP **110**. Examples of the information indicating the functions (capabilities) supported by an MFP **110** include "executability of two-sided printing", "supported sheet sizes", "postprocessing capabilities", "encrypted printing", and "file formats".

[0091] In step S**706**, the CPU **201** of the MFP **111** receiving the information indicating a request for capability information transmits the capability information about the MFP **111** to the cloud server **120** as a response (Get-Printer-

Attributes Response). In the present exemplary embodiment, the MFPs **110** transmit their capability information to the cloud server **120** in response to receipt of a request for capability information from the cloud server **120**. However, this is not restrictive. For example, the MFPs **110** may transmit the capability information to the virtual printer together with the registration request. In such a case, the cloud server **120** may perform the following processing on the capability information received with the registration request without transmitting the request for capability information.

[0092] In step S**707**, the CPU **301** of the cloud server **120** compares the desirable conditions (capability information) stored in step S**703** and the capability information about the MFP **111** received in step S**706**. Here, the CPU **301** determines whether the capability information that is the desirable conditions is included in the received capability information. For example, if the capability information that is the desirable conditions includes "A4" and "two-sided printing supported" and the received capability information includes "A4, A3" and "two-sided printing supported", the CPU **301** determines that the capability information that is the desirable conditions is included in the received capability information.

[0093] In step S**708**, the CPU **301** of the cloud server **120** transmits information (Register-Output-Device-Response) indicating whether a printer can be registered to the MFP **111** based on the result of the comparison made in step S**707**. If, in step S**707**, the capability information that is the desirable conditions is determined to be included in the received capability information, then in step S**708**, the CPU **301** registers the MFP **111** as a printer participating in the virtual printer, and transmits information indicating that the printer can be registered to the MFP **111**. If, in step S**707**, the capability information that is the desirable conditions is determined to be not included in the received capability information, then in step S**708**, the CPU **301** transmits information indicating that the printer is not registrable to the MFP **111**.

[0094] FIG. **8** is a diagram illustrating an example of the setting screen **800** for the desirable conditions, displayed on the operation unit **406** of the terminal apparatus **131**.

[0095] The setting screen **800** is a screen for setting conditions on the capabilities of the MFP **111** to be registered in the virtual printer.

[0096] A color item **801** is an item for setting whether the MFP to be registered in the virtual printer needs to support color printing. If the checkbox is checked, only MFPs supporting color printing can be registered in the virtual printer.

[0097] A finishing item **802** is an item for setting whether the MFP to be registered in the virtual printer needs to support postprocessing capabilities "staple" and "punch". If the staple checkbox is checked, only MFPs supporting stapling can be registered in the virtual printer. If the punch checkbox is checked, only MFPs supporting punching can be registered in the virtual printer.

[0098] A two-sided item **803** is an item for setting whether the MFP to be registered in the virtual printer needs to support two-sided printing. If the checkbox is checked, only MFPs supporting two-sided printing can be registered in the virtual printer.

[0099] A size item **804** is an item for setting whether the MFP to be registered in the virtual printer needs to support sizes such as A3, A4, and LETTER. If the checkbox of each size is checked, only MFPs supporting that size can be registered in the virtual printer. In FIG. **8**, the checkboxes of all the sizes A3, LEDGER, A4, LETTER, and LEGAL are selected. This indicates that the MFPs **110** to be registered in the virtual printer desirably support all the sheet sizes A3, LEDGER, A4, LETTER, and LEGAL.

[0100] A speed item **805** is an item for setting whether the MFP needs to be registered in the virtual printer to support the user-specified printing speed. Only MFPs capable of printing at a printing speed higher than or equal to the input numerical value can be registered in the virtual printer.

[0101] An encrypted printing item **806** is an item for setting whether the MFP to be registered in the virtual printer needs to support printing of encrypted print data. If the checkbox is checked, only MFPs that can decrypt encrypted print data and print the decrypted print data by input of a password or by identification (ID) card authentication can be registered in the virtual printer.

[0102] A file format item **807** is an item for setting whether the MFP to be registered in the virtual printer needs to support file formats such as PDF and PWG-Raster formats. If the checkbox of a file format is checked, only MFPs supporting the file format can be registered in the virtual printer. Neither of the PDF and PWG-Raster items on the setting screen **800** necessarily needs to be selected. The settings made on the setting screen **800** are stored in the HDD **304**.

[0103] The cloud server (virtual printer) **120** according to the present exemplary embodiment can convert a PDF file into a PWG-Raster file. An MFP supporting only the PWG-Raster format can therefore be registered in the same virtual printer as MFPs supporting both the PDF and PWG-Raster formats without issue. However, the cloud server (virtual printer) **120** according to the present exemplary embodiment is unable to convert an encrypted PDF file into a PWG-Raster file.

[0104] The setting screen **800** may be displayed on the display device **311** connected to the cloud server **120**, and settings may be accepted via the operation device **310** connected to the cloud server **120**.

[0105] FIG. **9** is a diagram illustrating examples of the capability information about the MFPs **110**. Capability information **901** represents the capability information about the MFP **111**. The capability information **901** indicates the functions supported by the MFP **111**. The capabilities of the MFP **111** include only "monochrome" printing for color output, "staple, punch" for finishing processing, and "long-edge binding, short-edge binding" for two-sided printing. The capability information **901** also indicates that supported sheet sizes are "A4, LETTER, LEGAL, A3, LEDGER", and the supported printing speed is 60 pages/minute. The capability information **901** further indicates that encrypted printing is supported, and supported file formats are the PDF and PWG-Raster formats.

[0106] Capability information **902** represents the capability information about the MFP **112**. The capabilities of the MFP **112** include "monochrome, color" for color output, "none" for finishing processing, and "not supported" for two-sided printing, and "A4, LETTER, LEGAL" for supported sheet sizes. The capability information **902** also indicates that the printing speed is 20 pages/minutes. The capability information **902** further indicates that encrypted

printing is supported, and the only supported file format is the PWG-Raster format (PDF is not supported).

[0107] FIGS. **10** to **12** illustrate examples of IPP communication messages exchanged between the MFPs **110** and the cloud server **120**.

[0108] FIG. **10** is a diagram illustrating examples of the messages in transmitting a printer registration request and a registration result notification in IPP communication between the cloud server **120** and an MFP **110**.

[0109] A message **1010** is an example of the message transmitted when the MFP **110** transmits a registration request (Register-Output-Device-Request) to the cloud server **120**. The message **1010** corresponds to the printer registration request transmitted in step S**704**. A message includes header information about the Hypertext Transfer Protocol (HTTP) layer and IPP message data on the HTTP layer.

[0110] IPP message data **1011** includes "ipp://XXXXX.local.:631/ipp/printer" that indicates the identifier of the MFP **110**. The cloud server **120** transmits a request for capability information and a registration result notification to the MFP **110** that applies to the identifier in the IPP message data **1011**.

[0111] A message **1020** is an example of the message transmitted when the cloud server **120** issues a request for capability information (Get-Printer-Attributes Request) to an MFP **110**. The message **1020** corresponds to the request transmitted in step S**705**.

[0112] IPP message data **1021** indicates the types of capability information to request from the MFP **110**. "Keyword value: 'color-supported'" is a keyword for requesting the availability of color printing, and "keyword value: 'finishings-supported'" the presence or absence of finishing processing supported. "Keyword value: 'sides-supported'" is a keyword for requesting the presence or absence of two-sided printing support, and "keyword value: 'media-supported'" the types of supported sheet types. "Keyword value: 'pages-per-minute'" is a keyword for requesting the printing speed (pages/minutes). "Keyword value: 'document-encryption-ciphers-supported'" is a keyword for requesting the presence or absence of encrypted printing support. "Keyword value: 'document-format-supported'" is a keyword for requesting the types of supported file formats.

[0113] FIG. **11** is a diagram illustrating examples of the message in transmitting the capability information about an MFP **110** in IPP communication between the cloud server **120** and the MFP **110**.

[0114] A message **1110** is an example of the message transmitted when the MFP **111** transmits capability information (Get-Printer-Attributes Response) to the cloud server **120** as a response. The message **1110** applies to the capability information transmitted in step S**706**.

[0115] IPP message data **1111** in the message **1110** indicates the capability information about the MFP **111**. "Color-supported (Boolean): false" indicates that only monochrome printing is available. "Finishings-supported (enum): staple, punch" indicates that stapling and punching are available as finishing processing. "Sides-supported (1setOf keyword): 'one-sided','two-sided-long-edge', 'two-sided-short-edge'" indicates that long-edge binding and short-edge binding are available in two-sided printing. "Media-supported (1 setOf keyword): 'iso_a4_210×297 mm','na_letter_8.5×11in', 'iso_a3_297×420 mm','na_ledger_11×17in'" indicates that the supported sheet sizes are A4, LETTER, A3, and LEDGER. "Pages-per-minute (integer): 60" indicates that the printing speed is 60 pages/minute.

[0116] "Document-encryption-ciphers-supported (1setOf type2 keyword): 'AES'" indicates that encrypted printing is supported. Advanced Encryption Standard (AES) is a typical encryption method of common key scheme. If other encryption schemes (such as Data Encryption Standard (DES) and Triple DES (3DES)) are supported, the plurality of schemes may be enumerated. "Document-format-supported (1setOf mimeMediaType): 'application/pdf','image/pwg-raster'" indicates that both the PDF and PWG-Raster formats are supported.

[0117] A message **1120** is an example of the message transmitted when the MFP **112** transmits capability information (Get-Printer-Attributes Response) to the cloud server **120** as a response. The message **1120** applies to the capability information transmitted in step S**706**.

[0118] IPP message data **1121** in the message **1120** indicates the capability information about the MFP **112**. "Color-supported (Boolean): true" indicates that both monochrome printing and color printing are available. "Finishings-supported (enum): none" indicates that no finishing processing is available. "Sides-supported (1setOfkeyword): 'one-sided'" indicates that two-sided printing is not available.

[0119] "Media-supported (1setOf keyword): 'iso_a4_210×297 mm','na_letter_8.5×11in','na_legal_8.5×14in'" indicates that the supported sheet sizes are A4, LETTER, and LEGAL.

[0120] "Pages-per-minute (integer): 20" indicates that the printing speed is 20 pages/minute. "Document-encryption-ciphers-supported (1setOf type2 keyword): 'AES'" indicates that encrypted printing is supported. "Document-format-supported (1setOf mimeMediaType): 'image/pwg-raster'" indicates that the supported file format is the PWG-Raster format.

[0121] FIG. **12** is a diagram illustrating examples of the message of the registration result notification (Register-Output-Device-Response) that the cloud server **120** transmits to an MFP **110** in IPP communication between the cloud server **120** and the MFP **110**. This message corresponds to the information indicating that the printer can be registered, which is transmitted in the processing of step S**708**.

[0122] A message **1210** is an example of the message of the registration result notification (Register-Output-Device-Response) that the cloud server **120** transmits to an MFP **110**.

[0123] IPP message data **1211** "status-code: Successful (successful-ok)" in the message **1210** indicates that the cloud server **120** has registered the MFP **110** as one of the printers of the cloud server **120**.

[0124] A message **1220** is an example of the message of the registration result notification (Register-Output-Device-Response) that the cloud server **120** transmits to an MFP **110**. The message **1220** corresponds to the information indicating that the printer is not registrable, transmitted in the processing of step S**708**.

[0125] IPP message data **1221** "status-code: Error (client-error-not-possible)" indicates that the cloud server **120** has not registered the MFP **110** as one of the printers of the virtual printer.

[0126] The IPP message data **1222** further indicates a capability insufficient for the cloud server **120** to register the MFP **110** as one of the printers of the virtual printer. In other

words, the IPP message data **1222** indicates the lacking capability compared to the capabilities that are the desirable conditions set in the virtual printer. "Document-format-supported (1setOf mimeMediaType): 'application/pdf'" indicates that the MFP **110** has failed to be registered as one of the printers of the virtual printer because PDF is not supported.

[0127] FIG. **13** is a diagram illustrating examples of the participation registration screen displayed on the operation unit **208** of the MFP **111**.

[0128] The participation registration screen **1300** is a screen for the user to register a virtual printer in which the MFP **111** participates via the operation unit **208**. The participation registration screen **1300** is displayed when the CPU **201** executes the processing of step S**704**.

[0129] An input field **1301** accepts the user's operations. Here, a Universal Resource Locator (URL) "ipp://www.example.com/ipp/print" that is the identifier of the virtual printer in which the MFP **111** participates is input in the input field **1301**. The user may directly input the identifier to the input field **1301** by operating a software keyboard. Identifies input in the past may be stored as a history, and one of the identifiers may be selected from the history for input. The identifier input to the input field **1301** is not limited to a URL. For example, a Universal Resource Identifier (URI), an IP address, or a multimedia access control (MAC) address may be used.

[0130] If a registration button **1302** is selected by the user, the MFP **111** transmits a printer registration request to the cloud server **120** based on the identifier (URL) input in the input field **1301**. This processing corresponds to the processing of step S**704**.

[0131] The participation registration screen **1310** is a screen displayed if the registration button **1302** is selected by the user and the MFP **111** transmits a registration request to the cloud server **120** and receives information indicating that the MFP **111** can be registered (is registered) in the virtual printer from the cloud server **120**.

[0132] A comment **1311** is text displayed if the MFP **111** receives the information that the MFP **111** can be registered (is registered) in the virtual printer from the cloud server **120**.

[0133] The participation registration screen **1320** is a screen displayed if the registration button **1302** is selected by the user and the MFP **111** transmits a registration request to the cloud server **120** and receives information indicating that the MFP **111** is not registrable (not registered) in the virtual printer.

[0134] A comment **1321** is text displayed if the MFP **111** receives the information indicating that the MFP **111** is not registrable (not registered) in the virtual printer from the cloud server **120**. The comment **1321** displays the failure of the registration in the virtual printer and the cause of the failure, i.e., that the MFP **111** lacks the PDF print function.

[0135] Only the administrator user of the MFP **111** may display the participation registration screen **1300** and give a participation instruction to the cloud server **120**.

[0136] FIG. **14** is a flowchart illustrating an example of processing in registering the MFP **111** in the virtual printer. The processing of the flowchart illustrated in FIG. **14** is implemented by the CPU **201** reading a program stored in the ROM **202** into the RAM **203** and executing the program. The processing in the flowchart illustrated in FIG. **14** is started if an instruction to display the participation registration screen **1300** on the operation unit **208** is accepted from the user.

[0137] In step S**1401**, the CPU **201** displays the participation registration screen **1300** on the operation unit **208**.

[0138] In step S**1402**, the CPU **201** determines whether the registration button **1302** is selected by the user via the operation unit **208**. If the CPU **201** determines that the registration button **1302** is selected (YES in step S**1402**), the processing proceeds to step S**1403**. If the CPU **201** determines that the registration button **1302** is not selected (NO in step S**1402**), the processing returns to step S**1402**.

[0139] In step S**1403**, the CPU **201** transmits a registration request (Register-Output-Device-Request) to a virtual printer based on the identifier (URL) input to the input field **1301** of the participation registration screen **1300**. For the sake of convenience, an example where the registration request is transmitted to the virtual printer on the cloud server **120** will be described here.

[0140] In step S**1404**, the CPU **201** determines whether an IPP message is received from the cloud server **120**. If the CPU **201** determines that an IPP message is received (YES in step S**1404**), the processing proceeds to step S**1405**. If the CPU **201** determines that no IPP message is received (NO in step S**1404**), the processing returns to step S**1404**.

[0141] In step S**1405**, the CPU **201** determines whether the IPP message received in step S**1404** is a request for capability information (Get-Printer-Attributes Request). If the IPP message is a request for capability information (YES in step S**1405**), the processing proceeds to step S**1406**. If the IPP message is not a request for capability information but a registration result notification (Register-Output-Device-Response) (NO in step S**1405**), the processing proceeds to step S**1407**.

[0142] In step S**1406**, the CPU **201** transmits the capability information (Get-Printer-Attributes Response) indicating the capabilities of the MFP **111** as a response to the request for capability information received from the cloud server **120**. The IPP message transmitted from the MFP **111** here is the message **1110**.

[0143] In step S**1407**, the CPU **201** interprets the IPP message that is the received registration result notification, and determines whether the MFP **111** is registered in the virtual printer. Specifically, if the received registration result notification is one like the message **1210** indicating that MFP **111** is registered, the CPU **201** determines that the MFP **111** is registered. If the received registration result notification is one like the message **1220** indicating that the MFP **111** is not registered, the CPU **201** determines that the MFP **111** is not registered. If the CPU **201** determines that the MFP **111** is registered (YES in step S**1407**), the processing proceeds to step S**1408**. If the CPU **201** determines that the MFP **111** is not registered (NO in step S**1407**), the processing proceeds to step S**1409**.

[0144] In step S**1408**, the CPU **201** displays a screen indicating that the registration is successful on the operation unit **208**. The screen displayed here is one like the participation registration screen **1310**. If the registration is successful, the CPU **201** stores the identifier of the virtual printer in the HDD **204**.

[0145] In step S**1409**, the CPU **201** displays a screen indicating that the registration is failed on the operation unit **208**. The screen displayed here is one like the participation registration screen **1320**.

[0146] FIG. **15** is a flowchart illustrating an example of processing when the cloud server **120** registers an MFP **110**. The processing of the flowchart illustrated in FIG. **15** is implemented by the CPU **301** reading a program stored in the ROM **302** into the RAM **303** and executing the program. The program to be read by the CPU **301** into the RAM **303** may be stored in a storage device such as the HDD **304**. The processing in the flowchart illustrated in FIG. **15** is started by power-on of the cloud server **120**.

[0147] In step S**1501**, the CPU **301** determines whether an IPP message is received. If the CPU **301** determines that an PP message is received (YES in step S**1501**), the processing proceeds to step S**1502**. If the CPU **301** determines that no IPP message is received (NO in step S**1501**), the processing returns to step S**1501**.

[0148] In step S**1502**, the CPU **301** determines whether the received IPP message is information indicating capability information that is desirable conditions received from a terminal apparatus **130**. If the IPP message is information indicating capability information that is desirable conditions (YES in step S**1502**), the processing proceeds to step S**1510**. If the IPP message is not information indicating capability information that is desirable conditions (NO in step S**1502**), the processing proceeds to step S**1503**.

[0149] In step S**1510**, the CPU **301** stores the information indicating the capability information that is the desirable conditions, received from the terminal apparatus **130**, into the HDD **304**.

[0150] In step S**1503**, the CPU **301** determines whether the received IPP message is a registration request (Register-Output-Device-Request) received from an MFP **110**. If the PP message is a registration request (YES in step S**1503**), the processing proceeds to step S**1504**. If the IPP message is not a registration request (NO in step S**1503**), the processing proceeds to step S**1520**.

[0151] In step S**1504**, the CPU **301** turns on a registration request flag indicating that an MFP **110** is requesting registration. Specifically, the CPU **301** stores information indicating that registration is being requested in the RAM **303**.

[0152] In step S**1505**, the CPU **301** transmits a request for capability information (Get-Printer-Attributes Request) to the MFP **110** transmitting the IPP message.

[0153] Now, the case where the IPP message is determined to be not a registration request received from an MFP **110**, i.e., to be capability information (Get-Printer-Attributes Response) received from the MFP **110** in step S**1503** (NO in step S**1503**) will be described.

[0154] In step S**1520**, the CPU **301** determines whether the registration request flag is on. If the registration request flag is determined to be on (YES in step S**1520**), the processing proceeds to step S**1521**. If the registration request flag is determined to not be on (NO in step S**1520**), the processing returns to step S**1501**.

[0155] In step S**1521**, the CPU **301** compares the received capability information (Get-Printer-Attributes Response) and the capability information that is the desirable conditions, stored in the HDD **304**, to determine whether the received capability information satisfies the desirable conditions. If the received capability information is determined to satisfy the desirable conditions (YES in step S**1521**), the processing proceeds to step S**1522**. If the received capability information is determined to not satisfy the desirable conditions (NO in step S**1521**), the processing proceeds to step S**1530**. Here, if the received capability information does not satisfy the capability information that is the desirable condition on the file format, the MFP **110** transmitting the capability information may be registered in the virtual printer. The reason is that the cloud server **120** can convert an unencrypted PDF print job received from the terminal apparatus **131** into the PWG-Raster format. For example, if PDF is set in the file format item **807** as capability information that is the desirable condition and the cloud server **120** receives a registration request from an MFP **110** that supports only the PWG-Raster format, the cloud server **120** permits the registration. By such processing, image forming apparatuses that do not satisfy the desirable condition but can execute a print job transmitted from a terminal apparatus through the use of format conversion can be registered in the virtual printer.

[0156] In step S**1522**, the CPU **301** stores the identifier of the MFP **110** transmitting the capability information (Get-Printer-Attributes Response) into the RAM **303**. Storing the identifier includes registering the MFP **110** in the virtual printer. The identifier may be stored in a nonvolatile area such as the HDD **304**. The identifier of the MFP **110** may be one indicated by the IPP message data **1011** or the IP address or MAC address of the MFP **110**. Storing the identifiers of the MFPs **110** and determining whether access is made from an MFP **110** having one of the identifiers allows only the MFPs **110** registered in the virtual printer to execute print jobs stored in the HDD **304** in association with the identifier of the virtual printer. This prevents MFPs not satisfying the desirable conditions from requesting or executing the print jobs, whereby the user's trouble with checking the capabilities of the MFPs can be reduced.

[0157] The cloud server **120** according to the present exemplary embodiment stores the identifier of the MFP **110** transmitting the capability information if the received capability information satisfies the desirable conditions. However, this is not restrictive. For example, the cloud server **120** may store the received capability information about the MFP **110** and the name of the MFP **110** as well as the identifier of the MFP **110** transmitting the capability information. The cloud server **120** may also store state information about the MFP **110**. The state information is information indicating whether to maintain the MFP **110** to be registered in the virtual printer in an activated state. An MFP **110** in the activated state can receive a print job from the cloud server **120**. An MFP **110** not in the activated state is unable to receive a print job from the cloud server **120**. Even if the MFP **110** is not in the activated state, the MFP **110** is registered in the virtual printer as one not in the activated state.

[0158] In step S**1523**, the CPU **301** transmits a registration result notification (Register-Output-Device-Response) indicating that the MFP **110** can be registered to the MFP **110** transmitting the IPP message.

[0159] For example, in the printing system discussed in Japanese Patent Application Laid-Open No. 2005-165393, an image forming apparatus not supporting PDF can execute a print job if the information processing apparatus such as a server converts the format of the print job as discussed in PWG "IPP Shared Infrastructure Extensions", ftp://ftp.pwg.org/pub/pwg/ipp/wd/wd-ippsix10-20140226.pdf.

[0160] Suppose, however, that image data is encrypted as discussed in PWG "IPP Document Encryption", http://ftp.pwg.org/pub/pwg/ipp/whitepaper/tb-doccrypt-20180205.pdf. In such a case, the information processing apparatus is

unable to convert the print job into a format supported by the image forming apparatus since the information processing apparatus does not know the decryption key.

[0161] The image forming apparatus not satisfying the desirable conditions, even if registered in the virtual printer as with the case where the format of a print job can be converted (the print job is not encrypted), is therefore unable to execute the print job transmitted from a terminal apparatus. The information processing apparatus that registers an image forming apparatus not satisfying the desirable conditions in the virtual printer thus performs the following processing to allow the image forming apparatus registered in the virtual printer to execute the print job.

[0162] In steps **S1524** to **S1526**, the CPU **301** checks whether the desirable conditions need to be modified based on the capability information about the MFP **110** transmitting the IPP message. Such an operation is for the case where the file format is unable to be converted because of encrypted printing. Suppose, for example, that no file format is specified in the file format item **807**, and the MFP **111** supporting the PDF and PWG-Raster formats is registered. In such a case, if a PDF file is transmitted to the virtual printer, the MFP **111** can print the PDF file since the MFP **111** is capable of both PDF printing and PWG-Raster printing. Also, suppose that the MFP **112** not supporting PDF but encrypted printing is registered in the virtual printer after the MFP **111** supporting encrypted printing. In such a case, if an encrypted PDF job is transmitted to the virtual printer, the encrypted PDF job can be printed by the MFP **111** but not by the MFP **112**. The reason is that the virtual printer is unable to convert the encrypted PDF job into a PWG-Raster job.

[0163] By performing the above processing, the information processing apparatus that registers an image forming apparatus not satisfying the desirable conditions in the virtual printer can allow the image forming apparatus registered in the virtual printer to execute the print job.

[0164] In step **S1524**, the CPU **301** determines whether encrypted printing is defined in the desirable conditions. More specifically, the CPU **301** determines whether the checkbox of the encrypted printing item **806** on the setting screen **800** is checked and the setting is stored. If the CPU **301** determines that encrypted printing is defined (YES in step **S1524**), the processing proceeds to step **S1525** since the cloud server **120** is unable to convert a file format. If the CPU **301** determines that encrypted printing is not defined (NO in step **S1524**), the processing proceeds to step **S1531** since the cloud server **120** can convert a file format.

[0165] In step **S1525**, the CPU **301** determines whether any file format is defined in the desirable conditions. More specifically, the CPU **301** refers to the desirable conditions that is the capability information stored in the HDD **304**, and determines whether at least either one of the PDF and PWG-Raster formats is set as a file format in the desirable conditions. If the CPU **301** determines that any file format is already defined (YES in step **S1525**), the processing proceeds to step **S1531**. The reason is that the desirable conditions do not need to be updated since the file format is taken into account in determining whether the capability information satisfies the desirable conditions in step **S1521**. If the CPU **301** determines that no file format is defined (NO in step **S1525**), the processing proceeds to step **S1526**.

[0166] In step **S1526**, the CPU **301** modifies the desirable condition on the file format stored in the HDD **304** to the file format included in the capability information received in step **S1501**. For example, when the MFP **111** is initially registered in the virtual printer, the desirable condition on the file format is the PDF and PWG-Raster formats. If the MFP **112** is then registered in the virtual printer, the desirable condition on the file format is rewritten as the PWG-Raster format. If the desirable condition is rewritten in step **S1526**, a setting screen on which the desirable condition is reflected may be displayed when the user displays the setting screen **800** again. If the desirable condition is rewritten in step **S1526**, the terminal apparatus **131** may display a screen or notification indicating the modification of the desirable condition when connected to the cloud server **120**.

[0167] In step **S1530**, the CPU **301** transmits a registration result notification (Register-Output-Device-Response) indicating that the MFP **110** transmitting the IPP message is not registrable to the MFP **110**.

[0168] In step **S1531**, the CPU **301** turns off the registration request flag indicating that an MFP **110** is requesting registration. Specifically, the CPU **301** stores information indicating that registration is not being requested into the RAM **303**.

[0169] By performing the foregoing processing, the user's trouble when an image forming apparatus receives an encrypted print job stored in the information processing apparatus from the information processing apparatus and executes the print job based on the user's operations can be reduced.

[0170] FIG. **16** is a diagram illustrating an example of a sequence of print processing where the terminal apparatus **131** transmits a print job to the cloud server **120** and the MFP **111** executes the print job. This sequence is started when the user operates the terminal apparatus **131** and gives an instruction to display a print setting screen **1700** illustrated in FIG. **17**. The sequence is implemented by the apparatuses performing IPP communication.

[0171] In step **S1601**, the CPU **401** of the terminal apparatus **131** transmits information (Get-Printer-Attributes Request) indicating a request for capability information about the virtual printer to the cloud server **120**. The capability information about the virtual printer refers to information indicating the functions supported by the virtual printer. Examples of the information indicating the functions (capabilities) supported by the virtual printer include "executability of two-sided printing", "supported sheet sizes", "postprocessing capabilities", "encrypted printing", and "file formats".

[0172] In step **S1602**, the CPU **301** of the cloud server **120** receiving the information indicating a request for the capability information transmits the capability information about the virtual printer to the terminal apparatus **131** as a response (Get-Printer-Attributes Response).

[0173] In step **S1603**, the CPU **401** of the terminal apparatus **131** generates print data based on the file format(s) included in the capability information about the virtual printer, received in step **S1602**, in response to acceptance of a print instruction from the user. If the virtual printer supports only the PWG-Raster format, the CPU **401** generates the print data in the PWG-Raster format. The PWG-Raster format has the benefit of being printable in most printing apparatuses, but has difficulty in obtaining image quality at resolutions corresponding to the capabilities of the printing apparatuses. Print data is thus desirably generated in the PDF format if high priority is given to image quality.

[0174] In step S**1604**, the CPU **401** of the terminal apparatus **131** transmits the print job (Create-Job) to the cloud server **120** that is the virtual printer.

[0175] In step S**1605**, the CPU **301** of the cloud server **120** that is the virtual printer stores the print job into the HDD **304** in the cloud server **120**.

[0176] In step S**1606**, the CPU **201** of the MFP **111**, in response to acceptance of an execution instruction for the print job from the user, transmits a transmission request (Fetch-Job) for the print job corresponding to the execution instruction to the cloud server **120**.

[0177] In step S**1607**, the cloud server **120** transmits the print job stored in step S**1605** to the MFP **111** by IPP communication in response to the transmission request (Fetch-Job) for the print job, received from the MFP **111**. Here, the print job associated with the user is transmitted to the MFP **111**.

[0178] In step S**1608**, the MFP **111** receives the print job transmitted from the cloud server **120** and performs print processing. The present processing is ended.

[0179] A screen displayed on the operation unit **406** of the terminal apparatus **131** in instructing the virtual printer to perform printing will be described with reference to FIG. **17**.

[0180] FIG. **17** is a diagram illustrating an example of a print setting screen displayed on the operation unit **406** of the terminal apparatus **131**.

[0181] A print setting screen **1700** is a screen displayed on the operation unit **406** of the terminal apparatus **131**. A print job is generated and transmitted to the cloud server **120** when the print setting screen **1700** is operated by the user.

[0182] An options button **1701** is a button used to display a screen for setting a printer to be used like a screen **1710** when selected by the user.

[0183] The print setting screen **1710** is a screen for selecting the printer to execute the print job. A check mark is displayed on the left of the name of the selected printer.

[0184] A button **1711** is a button for displaying detailed information about the "virtual printer www.example.com" when selected by the user. A print setting screen **1720** is the screen displayed here.

[0185] A button **1712** is a button for displaying detailed information about the "local printer 1 localprint1" when selected by the user.

[0186] The print setting screen **1720** is displayed when the button **1711** is selected, and displays detailed information about the "virtual printer www.example.com".

[0187] An item **1721** indicates how the "virtual printer www.example.com" is connected to the terminal apparatus **131**. An item **1722** indicates the URL of the "virtual printer www.example.com". If the selected printer is a virtual printer like the "virtual printer www.example.com", an item **1723** lists printers participating in the virtual printer.

[0188] A print button **1702** is a button for transmitting the print settings made on the print setting screen **1700** and the print job including the user-selected image data to the selected printer and causing the printer to perform print processing when selected by the user.

[0189] A printer button **1703** is a button for displaying the print setting screen **1720** displaying detailed information about the printer when selected by the user.

Other Exemplary Embodiments

[0190] Processing in an exemplary embodiment of the present disclosure includes supplying a storage medium storing program code for implementing the functions of the foregoing exemplary embodiments to a system or an apparatus, and reading the program code stored in the storage medium by a computer (or CPU or microprocessing unit (MPU)) of the system or apparatus. In such a case, the program code itself read from the recording medium implements the functions of the foregoing exemplary embodiments, and the program code constitutes an exemplary embodiment of the present disclosure.

[0191] An exemplary embodiment of the present disclosure also covers a case where the functions of the foregoing exemplary embodiments are implemented by executing the read program code by the computer. An exemplary embodiment of the present disclosure also covers a case where an OS running on the computer performs part or all of the actual processing based on instructions of the program code, and the functions of the foregoing exemplary embodiments are implemented by such processing.

Other Embodiments

[0192] Embodiment(s) of the present disclosure can also be realized by a computer of a system or apparatus that reads out and executes computer executable instructions (e.g., one or more programs) recorded on a storage medium (which may also be referred to more fully as a 'non-transitory computer-readable storage medium') to perform the functions of one or more of the above-described embodiment(s) and/or that includes one or more circuits (e.g., application specific integrated circuit (ASIC)) for performing the functions of one or more of the above-described embodiment(s), and by a method performed by the computer of the system or apparatus by, for example, reading out and executing the computer executable instructions from the storage medium to perform the functions of one or more of the above-described embodiment(s) and/or controlling the one or more circuits to perform the functions of one or more of the above-described embodiment(s). The computer may include one or more processors (e.g., central processing unit (CPU), micro processing unit (MPU)) and may include a network of separate computers or separate processors to read out and execute the computer executable instructions. The computer executable instructions may be provided to the computer, for example, from a network or the storage medium. The storage medium may include, for example, one or more of a hard disk, a random-access memory (RAM), a read only memory (ROM), a storage of distributed computing systems, an optical disk (such as a compact disc (CD), digital versatile disc (DVD), or Blu-ray Disc (BD)™), a flash memory device, a memory card, and the like.

[0193] While the present disclosure has been described with reference to exemplary embodiments, it is to be understood that the disclosure is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

[0194] This application claims the benefit of Japanese Patent Application No. 2018-241727, filed Dec. 25, 2018, which is hereby incorporated by reference herein in its entirety.

What is claimed is:

1. An information processing apparatus comprising:

a registration unit configured to register a first image forming apparatus in a virtual printer; and

a reception unit configured to receive capability information from the first image forming apparatus, wherein the capability information includes at least information indicating that the first image forming apparatus executes an encrypted print job,

wherein the registration unit is configured not to register a second image forming apparatus corresponding to predetermined capability information received by the reception unit, and

wherein the predetermined capability information does not include information that the second image forming apparatus executes the encrypted print job.

2. The information processing apparatus according to claim **1**, further comprising an acceptance unit configured to accept information indicating a capability desirable for a third image forming apparatus to be registered in the virtual printer,

wherein, if the information accepted by the acceptance unit indicates that a capability to execute the encrypted print job is desirable for the third image forming apparatus, the registration unit does not register the second image forming apparatus corresponding to the predetermined capability information received by the reception unit, and

wherein, if the information accepted by the acceptance unit does not indicate that the capability to execute the encrypted print job is desirable for the third image forming apparatus, the registration unit registers the second image forming apparatus corresponding to the predetermined capability information received by the reception unit.

3. The information processing apparatus according to claim **1**, further comprising a transmission unit configured to transmit, to the first image forming apparatus, information indicating whether the first image forming apparatus is successfully registered in the virtual printer by the registration unit.

4. The information processing apparatus according to claim **3**, wherein information transmitted by the transmission unit and indicating that the first image forming apparatus is not successfully registered in the virtual printer includes information indicating a capability that the first image forming apparatus does not have among capabilities indicated by information accepted by an acceptance unit.

5. The information processing apparatus according to claim **1**, further comprising:

a second reception unit configured to receive an identifier of the first image forming apparatus from the first image forming apparatus as a registration request; and

a request unit configured to request information indicating a capability of the first image forming apparatus to the first image forming apparatus based on reception of the identifier by the second reception unit.

6. The information processing apparatus according to claim **5**, further comprising a first storage unit configured to store the identifier in a case where the predetermined capability information does not include the information indicating that the second image forming apparatus executes the encrypted print job.

7. The information processing apparatus according to claim **1**, further comprising:

a second storage unit configured to store a print job transmitted from a terminal apparatus;

a third reception unit configured to receive information from the first image forming apparatus, wherein the information indicates a request to transmit the print job; and

a second transmission unit configured to transmit the print job stored in the second storage unit to the first image forming apparatus based on reception of the information indicating the request to transmit the print job by the third reception unit.

8. The information processing apparatus according to claim **1**, wherein the information processing apparatus is a cloud server.

9. The information processing apparatus according to claim **1**, wherein the information processing apparatus is an information processing apparatus supporting a predetermined printing protocol.

10. The information processing apparatus according to claim **9**, wherein the predetermined printing protocol is an Internet Printing Protocol (IPP).

11. A method of controlling an information processing apparatus, the method comprising:

registering a first image forming apparatus in a virtual printer;

receiving capability information from the first image forming apparatus, wherein the capability information includes at least information indicating that the first image forming apparatus executes an encrypted print job; and

not registering a second image forming apparatus corresponding to received predetermined capability information,

wherein the predetermined capability information does not include information that the second image forming apparatus executes the encrypted print job.

12. A non-transitory computer-readable storage medium storing a program that, when executed by a computer, causes the computer to perform a method of controlling an information processing apparatus, the method comprising:

registering a first image forming apparatus in a virtual printer;

receiving capability information from the first image forming apparatus, wherein the capability information includes at least information indicating that the first image forming apparatus executes an encrypted print job; and

not registering a second image forming apparatus corresponding to received predetermined capability information,

wherein the predetermined capability information does not include information that the second image forming apparatus executes the encrypted print job.

13. The storage medium according to claim **12**, the method further comprising accepting information indicating a capability desirable for a third image forming apparatus to be registered in the virtual printer,

wherein, if the accepted information indicates that a capability to execute the encrypted print job is desirable for the third image forming apparatus, registering includes not registering the second image forming apparatus corresponding to the received predetermined capability, and

wherein, if the accepted information does not indicate that the capability to execute the encrypted print job is desirable for the third image forming apparatus, regis-

tering includes registering the second image forming apparatus corresponding to the received predetermined capability information.

14. The storage medium according to claim **12**, the method further comprising transmitting, to the first image forming apparatus, information indicating whether the first image forming apparatus is successfully registered in the virtual printer.

15. The storage medium according to claim **14**, wherein transmitted information indicating that the first image forming apparatus is not successfully registered in the virtual printer includes information indicating a capability that the first image forming apparatus does not have among capabilities indicated by accepted information.

16. The storage medium according to claim **12**, the method further comprising:

receiving an identifier of the first image forming apparatus from the first image forming apparatus as a registration request; and

requesting information indicating a capability of the first image forming apparatus to the first image forming apparatus based on reception of the identifier.

17. The storage medium according to claim **16**, the method further comprising storing the identifier in a case where the predetermined capability information does not include the information indicating that the second image forming apparatus executes the encrypted print job.

18. The storage medium according to claim **12**, the method further comprising:

storing a print job transmitted from a terminal apparatus;

receiving information from the first image forming apparatus, wherein the information indicates a request to transmit the print job; and

transmitting the stored print job to the first image forming apparatus based on reception of the information indicating the request to transmit the print job.

19. The storage medium according to claim **12**, wherein the first image forming apparatus is an image forming apparatus supporting a predetermined printing protocol.

20. The storage medium according to claim **19**, wherein the predetermined printing protocol is an Internet Printing Protocol (IPP).

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